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THE AMERICAN GAS LIGHT JOURNAL INC.

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Buying Power.

By AN EXPERIENCED ENGINEER.

One most vital and potent subject which has received very little attention as a whole is that of buying. A large number of companies buy injudiciously, without thought, investigation or test. They will work night and day to show operating results, but the subject of buying is neglected, owing to ignorance as to its importance to the companies. In an experience covering over 20 years in the gas field, especially as Consulting and Supervising Engineer, the writer has seen all kinds of judicious and injudicious buying; therefore an article on this subject should be of benefit.

We seldom realize that the purchasing department is really the main factor in regulating so much of the operating costs. As a rule the average purchasing agent has so little to go by, on account of his lack of knowledge, etc., that when the final facts are shown, it is either necessary to call in someone else for information, or take the word of the salesman. The main question is, are you buying "quality," or are you buying and paying for "personality and quantity?" Have you laid down any fixed rules, requirements, etc., do you know that you are getting the full value for your money and are buying something that will prove a profitable investment; or are you just buying because you think it the best? Have you investigated the merits of the different raw materials, appliances, etc., and have you full knowledge of what the results will be? Are you positive that you have purchased coal for quality and not for quantity or appearance; have you purchased oil from that company, or this company, because it was cheaper than the other fellows, or have you investigated and bought it because you received full value for your money, and that the final result will be towards reducing your operating costs, instead of increasing them? Did you purchase coke for your water gas machine just because the price was lower here than there, or because it was the right coke? Did you buy those gas ranges because they sell readily, and you thought the price was right, or did you buy them because of quality, and because you are positive that you will have little or no gratuitous work to keep them in use? Do you buy a range that sells easily and looks pretty, because the travelling man and the house he represents are good fellows? So on down the line, these questions can be asked, and they mean so much. Let us first consider the manufacturing department. If our plant is in operation we have no construction to consider, but there is a possibility that we need renewals and additions. We need firebrick for either coal gas benches or water gas machines, therefore the question is what is the best kind. Will you buy from this or that company because you like the personality of the company, or are you going to buy firebrick that will give you full value for your money? What do you need then to go by? You have no chemical laboratory at your disposal, and your plant is too small to afford one; therefore, how are you sure you are buying the right kind of firebrick? Many men have little or no technical knowledge, and this article is for them more than those in the larger companies where a full corps of engineers, etc. are employed. Will you sit down and read a lot of, to you, meaningless technical analyses, or are you going to depend upon what the representative says? He is selling goods, and his own goods. If he is the right man for his house he must believe that his goods are the best in every respect; he is there to sell them and not the other fellow's. Then again, possibly his knowledge of the real factor is not as good as it might be; so, should you accept his word? The answer is "No." You must be sure you are right, and that the firebrick you buy will meet your requirements. Therefore, your best guide is the quality of the firebrick, its infusibility, strength, regularity of shape, uniformity of composition and facility of cutting. The infusibility can be determined to a certain extent by analysis; if the brick has about 60 per cent. silica, less than 6 per cent. of sesqui-oxide of iron, and not more than 2 to 3 per cent. total lime, magnesia, etc., it should be rejected. A better plan is to place a few bricks in the bottom of the superheater of a water gas set, or in the combustion chamber of a bench, and if after 2 weeks the brick shows the edges and corners still sharp, and the surface has no signs of incipient fusion, the brick can be accepted. Uniformity of composition can be tested by breaking the brick and examining the fracture. This should present a compact and uniform appearance, though not necessarily a close fine texture. Some engineers prefer the coarse texture. Uniformity of composition is also indicated by a ringing sound when the brick is struck with a hammer.

The selection of iron work, condensers, etc., should always be left to the engineer, but buy the best that you can. Remember it is not a gain to have a piece of metal 2 inches thick when ½ inch thick will do. That is why an engineer should be consulted. He knows or ought to know.

Now we come to our raw materials, gas-coal the first subject. Are you now buying coal because this or that man said it was the best, or because the representative was a prince; are you buying a cer-

tain grade of coal because it cost 25c. less per ton than the other; and are you sure you are getting your money's worth? Has the coal you buy as small an amount of ash and sulphur as possible, and a comparatively large percentage of volatile matter of good illuminating value, and does it possess coking qualities that permit the production of good salable coke amounting to from 55 to 65 per cent. of the original weight of the coal? If you are not positive about these things, or don't know about them, you are buying Personality, Quantity and not quality. If the coal you have does not come up to these requirements, you are not getting the yield you should at the plant, if your sulphur is high your purifiers are working overtime or harder than they should, and though you may save a little on the coal, you are paying more in purifier material, poor coke, lack of efficiency of your apparatus and labor, etc., all down the line. You save a nickle on coal and may be spending twice that much on the rest. You have failed to realize upon your buying power. Therefore why not establish a proper standard? You will find that a good standard for gas coal is:

Volatile matter.....	33.0 to 35 0	per cent.
Fixed carbon or coke.....	60.0 to 55.0	"
Ash	6.0 to 4.0	"
Sulphur.....	0.4 to 0.6	"

When you think about next year's contract, get a complete analysis of all the gas coals within your jurisdiction; pick out those meeting your standard, and purchase three or four cars of each of them. Then make a practical test. Watch your meter a little closer, watch your heats. Some coals need higher heats than others in order to get full efficiency, find this out. After you have tested these coals you will be able to tell which really is preferable; and you are then ready to utilize your buying power. You will save money in the end, and so prove that the buying of raw materials of the right kind, is the stepping stone to good earnings for your stockholders.

The same rule applies to gas oil. If you are buying a 32° to 34° oil see that you get it; and above all buy from some one that gives a uniform grade at all times. Be sure the oil you buy is the right kind and low in sulphur. Before you sign your contract, purchase a car or two, make a working test and see if the oil gives good results. Know whether you are buying gas oil sludge or real gas oil. Have every car of oil tested, even if only with a hydrometer. It is appalling to see what some companies buy and pay for, under the name of gas oil. The writer knew of one small plant where the gas oil was as thick as molasses and they thought they were getting first-class oil. When you buy gas oil, first be sure you are getting what you pay for. Don't think that you can buy just as good oil for 2 cents as you can for 4 cents, if you are negotiating with reliable concerns. If you know nothing about the commodity you need, get a book and read something about it, and have some idea of what the right thing is. Sometimes you feel that because a large concern asks a ¼ cent more than a little concern, that the larger one is holding you up. If you investigate, you usually find out that the large one is giving you in the end more for your money than the other, because in order to become large they must make reliable and substantial products. Too much cannot be said as to purchasing from the right place.

Coke or anthracite coal should be treated likewise. When you are within three months of the termination of your contract get samples from different dealers, try them out in your machines, and give them a fair test. Then you will realize why there is such a difference in price. Buy Quality and not Quantity. Quantity, in the end, means a big price for your whistle.

Lubricating oils, waste, etc., all should be investigated. Nothing should be purchased until you know that you are getting the best for your money. Test the raw materials under your existing conditions and with your own apparatus, and you will then be prepared to say which will help you in the end to get better operating results and so further your interests.

We must not forget the oxide. If you do not make your own and must purchase it, test a box full first, and revivify it once or twice before you make your decisions. The writer found it necessary to purchase a supply of oxide for two places, amounting to 10 carloads. Prices obtained ranged from 15 cents to as high as 32 cents per bushel. All companies made claims, and their representatives were willing to show the superiority of their oxide over the other. Enough to fill one box was purchased from each company and a test covering nearly a year made. One sample showed only half fouled when all the others showed foul more or less. At first it looked as if this sample would be preferable, but after it was fouled and an attempt made to revivify it as quickly as the others it would not work, taking four times as long to revivify as the others; and after three times used, it was practically worthless. The tests in the end showed the advisability of purchasing the oxide quoted at 18 cents per bushel. That was establishing a standard and buying quality and not quantity. In the end we got dollar for dollar, which is all that any man can expect. It was the results of the oxide that made its value, the cost of handling in revivification, its speed, etc. If the old rule had been followed it would have either been the cheapest, or the old belief that the best costs the most.

Nothing for the manufacturing department should be purchased without thorough investigation, even paints. In fact gas works paint is a big gamble with most all companies. We are not paint manufacturers, so we must take the word of the paint manufacturers, unless we try a sample under our conditions. As an example, four paints were tried from as many different companies, the next to the cheapest making the highest claims, but upon investigation we found that in order to do the work it would have to have two applications, so where was the saving? Test everything under your own conditions before you decide.

Now let us see what we can do in the Distribution Department. Is it preferable to use wrought, steel or cast iron pipe? You know your conditions. Then don't buy cast iron pipe because the representative visiting you is a good fellow. Investigate all prices. Know that the company gives you value for your money. Know that the pipe they sell has been tested for sand holes; and get a complete report on the pipe from the Distribution Superintendent so you know for the future. When you buy don't think that it is necessary to buy the heaviest drips and fittings made, and don't think that it is advisable to buy the lightest. If you are visited by a representative of a new type of pipe, don't think because his claims sound good that you have struck a gold mine. On pipe you cannot do much from an analysis standpoint, but you can get a great deal from a practical standpoint. especially from your Street-Main men.

In small steel or wrought pipe, remember the cheapest is not always what you want. Find out from the shop foreman and the fitters, how the pipe cuts; if it threads easily or if it splits, etc. Good wrought pipe should cut easily, and take a clean sharp thread with the least possible exertion. It should not split like so much of it does. It is these things that mean quality. Don't buy fittings from this house instead of that one because you get more fittings per pound. Find out from those using them how the threads are, if they get many split fittings, and if there are many sand holes, etc., and you will understand why there is a difference in prices so many times.

Now about tools. Every gas company must buy tools, and the question mark is what to buy to get the best value. Is it preferable to buy a pick axe because it is cheaper than any other; or is it cheaper to buy this one because it made of better material? Should you buy this type of wrench or the other? We cannot lay down a fixed rule, except to buy quality and not quantity; mix some gray matter with every purchase you make.

Now let us consider a vital department, in and for which we do our greatest amount of buying, the Commercial Department. Here is where the purchasing department can show its real ability with ease. First, appliances, and as this covers a very large field, let us start with gas ranges. Are you now handling a range that is the best baker, broiler, and cooker on the market; does it bake evenly and quickly with a minimum amount of gas; does the broiler broil well; and how is the efficiency of the top burners? What is the general construction of the range? Is it of good substantial material; what do you consider the life of that range? Does it impress you as likely that you will be called on to do a lot of gratuitous work on account of leaky joints, valves, etc., and are the burners constructed so that they can be easily cleaned? If you cannot answer these questions, prepare yourself right away. If you do not know, you are, 10 to 1, buying personality quantity instead of quality. When you are thinking about next year's supply of ranges get samples of as many as possible, and compare them. It means a little expense, but it will pay a hundred fold. Test them. To test the top burners for efficiency, determine the lengh of time and the amount of gas required to heat a definite quantity of water from a temperature of say 60° F. to the boiling point. The same kettle should be used in all the tests, and the same weight of water. Its temperature at the start, the time at which it begins to boil and the amount of gas consumed must be ascertained accurately in each case. Use a wet meter or a special test meter made for the purpose. To compare efficiency of

ovens, determine the amount of gas and the time required to bring each oven up to a baking heat, and then bake a definite weight of bread or biscuit. The dough should be ready before the ovens are heated up. Each oven should be tested for evenness of distribution of heat throughout the interior. This can be done by placing pieces of white writing or filter paper in different parts of the oven and noticing the extent to which they are browned when the oven is hot enough to bake. The more nearly they reach the same color, the more uniform is the distribution of heat in the oven, and the better it will bake. Some companies have pans made, fitting the oven, and test with three pans of dough in each oven. You would be surprissed at the results. The circulation in some stoves is absolutely wrong in every respect. You are the expert, and the consumer purchasing the stove goes by your decision. In this way you regulate the sale of ranges in your city, and you standardize. The result will be satisfied consumers and a reduction in gratuitous work costs. Don't buy the range that is the easiest to sell, and the cheapest. But buy the one that will give the consumer the most for his money, with a minimum consumption of gas. Remember, though you are not in business to sell gas appliances primarily, you are in business to sell appliances that will sell the commodity that you are interested in, gas. Your idea, therefore, must be to sell the consumer appliances that will give the highest efficiency. How can you determine this? There is but one way. Test all your appliances, especially the ranges. This is the reason the electric man is making such big strides; he sells the very best, because he standardizes everything. Years ago all he had was the old carbon filament lamp; then came the Tungsten and the tantulum and others, and now he has the new nitrogen lamp. Does he try to sell you the old type of lamp? No, he sells you the newest and the best. He does not talk price and quantity, he talks quality. Is that so with the average gasman? No, we know it is not, and that is why he has so much trouble; why he did not progress as fast as his competitor. He sold ranges along the line of least resistance, and was only looking to the present, not to the future.

Let us consider burners. To-day you can purchase a complete gas burner in a five-and-ten-cent store. Whose fault is it? No one but the gas man's. He failed to educate himself, and therefore did not educate his consumers. Instead of doing like our electric competitors, selling only the best and the most efficient, he handled the thing that sold the quickest and the cheapest, and with the result of complaints galore. People cannot get as good light from a cheap and inefficient burner as from a high class burner. It is not only the material and workmanship but the principles involved which count. If the gas man of the past had standardized, and bought and sold quality instead of quantity, the lighting business would be a great deal stronger than it is to-day. The average man wants his money's worth and the best for his money. What he wants is efficiency but he must depend upon you to show it to him. How can you give it to him, unless you have it yourself? It is that power which counts. Therefore in the future, before you buy this or that burner, test them out. Have a rack built in the cellar, or in the laboratory, or at the gas works, and connect them all up, and see what they will do. Test them for efficiency, see how much they will consume and the amount of light you get, etc.

Only in recent years has the gas man awakened to the fact that he was away behind the times in gas fixtures, compared with the improvements made by our elsctric competitors. It has not been the fault of the fixture manufacturers alone, but the gas man himself. He did not progress, but bought fixtures what would sell quick and cheap, in order to interest a consumer. He got the consumer all right, but after awhile the competitor came along showing a better and more artistic lighting effect. He showed him convenience, adaptability, and then sold him a high class substantial installation; and now you cannot get him back again. You were satisfied to buy quantity and not quality, but your competitor did the other way. Don't buy a pendant just because it is cheaper than the other fellows. There is usually a reason. Buy good substantial fixtures; see that the brass is finished right; that the cock is so well ground that it will not leak; and see that the canopy is amply strong; and in all cases try to sell the best and highest grade fixture you can. If you buy right the rest will come right.

Water heaters also need attention. Are you sure the water heater you got is the most efficient on the market for the money? Will it stand all tests? How does it match up with the others? Have you made any comparisons? If you have not, you are not aware what you are buying. You are blindly selling your consumer something you cannot vouch for. So in the future test them out. There are close to a hundred different makes on the market. You cannot test them all, but you can pick out a few and then select one by test. As an example, in one city the company had always handled one make of water heater, but changed at the request of the manager because the old type of heater cost $2.65 more than those offered by a representative who was such a good friend, etc. Over five hundred of the new heaters were sold and installed in one year. They had 20 feet of copper coil, and a so-called gas burner and cock, etc. The manager was well pleased, but the first time the fire department turned on the high pressure water for a big fire, nearly every one of the heaters split, and suit after suit was instituted against the gas company; and to-day it is practically impossible to interest the people of that city in water heaters. Whose fault was it? It was in the buying and nothing else. They wanted something cheap and got it. They sold something cheap, but in the end they paid a great deal more than if they had gotten a good substantial economical heater.

Heating stoves should be tested. Gas irons though not a source of heavy revenue still give a steady return, and every gas iron in use means some gas sold. Are you buying the most efficient gas iron on the market? Have you tested it; does it flash back; does the flame float; will it heat evenly; does the burner carbonize, etc.? In fact a dozen or more questions come up, and if you cannot answer them about the iron you purchased you are not buying quality. You must test the irons yourself; if you don't you will never know.

You can get gas mantles in the 5-and-10 cent stores, and you can buy mantles that cost 25 cents apiece. Have you tested the mantles you are selling? Do you know that they give your consumer full value for his money? Do you know which is the best mantle or are you taking the salesman's word for it? Why not have a small rack with a number of efficient gas burners, and burn a little gas to ascertain which mantle has the longest life, etc. In the end it will mean that you will sell a mantle which you know is the most efficient, and your consumer will be satisfied. He will buy your mantles because they are the best and he will be satisfied with gas lighting. The complaint department will have no calls for poor light, etc., and so reduce your gratuitous expense. It is the same with glassware, domes, hot plates, everything.

Industrial appliances are now an important factor, but this buying cannot be handled by the purchasing department without the full cooperation of the industrial appliance man.

Therefore, in order to fully utilize "Buying Power," in the future buy Quality and not Quantity. Do so only by your own tests. If your company is too small, combine your testing with some other small company or companies, and you will soon reap a bountiful harvest for your expense and efforts. One company, after a systematic testing of all appliances and standardization, reduced its gratuitous work over 90 per cent. and increased its sales over 120 per cent. in a space of four years. Why? Because consumers got the best appliances and the most efficient. They were satisfied with what they purchased and were always interested to try something new. The buyer of a company has a large control over its operating results, and if a company educates its consumers to purchase efficient appliances and so get the best results, it will have little or no trouble from competition, and so bring about a bigger gas business.

The Effect of Leaking Illuminating Gas on Bituminous Pavements.

[From a Paper by G. C. Warren, Read Before the American Society of Municipal Improvements.]

To everyone who has had experience in bituminous pavement construction and maintenance, it is known that illuminating gas escaping from the mains is very injurious to all kinds of bituminous pavements; and yet representatives of gas companies and city officials ridicule the idea that gas can have any effect on pavement surfaces.

The fact is that illuminating gas, a bituminous substance, and hydro carbon quite similar in chemical composition to light tar and oil distillates, is lighter and more penetrating than the distillates, and more rapidly attacks and liquifies a bituminous cement.

For testing the effect of illuminating gas on asphalt there is submitted herewith a very simple apparatus. Illuminating gas entered tube *C*, filled the jar and passed out tube *D* to a burner daily 8 a. m. to 5 p. m., from August 18 to October 5, 1914, except Sundays and Labor Day; jar was filled with quiet gas during nights, Sundays and Labor Day.

The jar has two baskets of No. 10 mesh screen. Basket *A* contains 1-inch cube of hard California refined asphalt, penetrating 20° Dow. *B* contains 1-inch cube of mixture consisting of well-graded sand 90 per cent., California asphaltic cement (75° Dow) 10 per cent.

A similar jar and contents which was not subjected to gas was kept alongside of the "gas jar" during the experiment to show that softening of material was due to gas and not change of temperature.

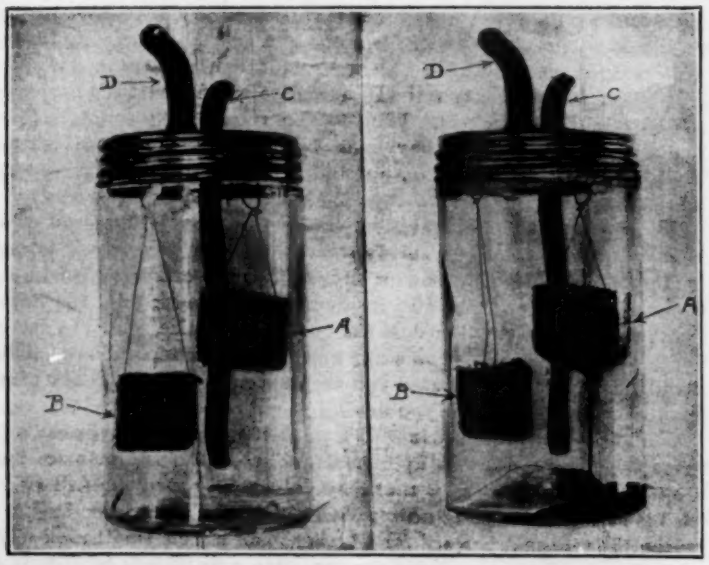

Fig. 1.—Glass jar containing baskets of hard asphalt and sand asphalt mixture. Photographed August 18.

Fig. 2. Condition, September 24th, 1914.

The daily diary of condition of asphalt and mixture is as follows:

	Basket *A*.	Basket *B*.
Aug. 19 to 27	No noticeable change	No change except mixture glossy and sticky
Aug. 28	Asphalt began to creep through, looking like small beads in the wire mesh	Same
Aug. 29	Same	Same
Aug. 31	Outside of basket coated with asphalt	Same
Sept. 1	Above condition slightly increased	Same
Sept. 2	Asphalt forming drop at bottom of basket	Same
Sept. 3	Asphalt increasing in softness; the drop has formed long pendant and small portion dropped to bottom of jar	Same
Sept. 4	More drops	Same
Sept. 5	More drops	Same
Sept. 8	Three distinct pendant drops; surface settled half-way down basket	Same as September 5.
Sept. 9	Same	Same
Sept. 10	Same	Same

September 11 to 28.—Impossible to make intelligible diary. Almost imperceptible changes from day to day. Continuous but slow leakage of asphalt from the basket. The long pendant drop broke September 12 A new drop started to form.

Results of Experiment.

	Mixture Basket.	Refined Asphalt Basket.
Net weight material at start	17.90 grams	14.13 grams
Net weight material 9-28 (41 days)	18.04 grams	10.52 grams
Increase in weight (0.78 per cent. of the mixture or 8 per cent. of the bitumen)	.14 grams	.....
Amount of asphalt dripped from basket	.....	3.61 grams
Per cent. asphalt dripped from basket	.....	25.50

The mixture of asphalt and sand has become reduced to a mixture of heavy oil and sand.

The foregoing experiment proves the following fundamental facts:

That illuminating gas without agitation rapidly liquifies asphalt cement and refined asphalt, and destroys its value as a cementing medium.

That illuminating gas not only attacks but combines with the asphalt, increasing its weight.

Commercial illuminating gas is very complex in composition, and that which produces the luminous portion of the normal flame is very similar in composition to benzol, which, when chemically pure, is a perfect solvent for the bitumen component of asphalts and coal tar pitches. It is natural, then, that when this gas comes in contact with any bituminous cement, more or less of the "illuminants" of the gas are absorbed by the bituminous cement and the candle-power of the gas correspondingly reduced; and it is on account of this fact that gas companies exercise great care in cooling the gas to condense and separate out as completely as possible all oils and tars.

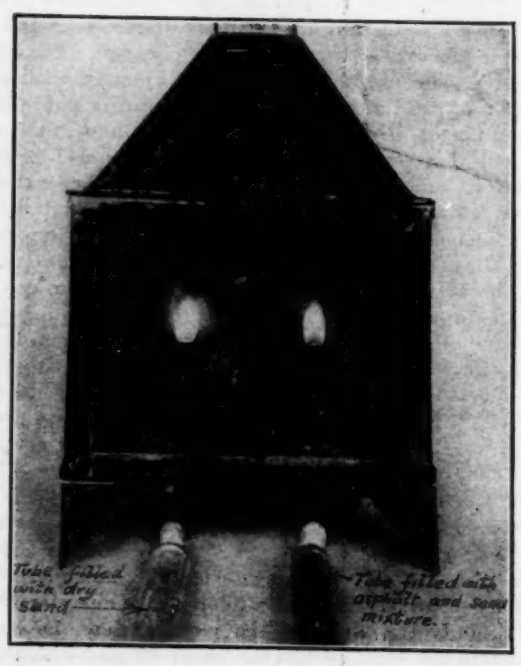

Fig. 3.—Front of apparatus open showing the burners and character of flames. On left, flame of normal illuminating gas. On right, flame from gas passed through sand asphalt mixture.

To show the rapidity with which asphalt cement will absorb illuminants from gas, we designed apparatus to compare the brilliancy of two flames of identical size, one burning normal gas passed through a glass tube containing dry sand, the other flame burning gas passed through a corresponding tube containing a sand asphalt mixture. It will be noted that in the normal flame the "blue" portion is very small and the flame luminous, while in the other the "blue" portion of the flame is relatively much larger and the flame itself of lower candle-power.

Having shown the effect on the bituminous cement and on the illuminating gas of their contact, the next step is to measure the effect on the bituminous material.

This was done by filling a quart fruit jar with liquid asphalt of specific gravity of 1.0, and using gas under high pressure. Two tubes were inserted; one for inlet of gas extending to bottom of jar; the outlet tube above the surface of the asphalt with a burner at end of tube.

After 12 days' exposure to passing gas the asphalt had increased 2.98 per cent. by weight and 4 per cent. in volume.

The characteristics of this liquid asphalt before and after exposure to gas, are as follows:

	Before.	After.
Specific gravity at 60° F	1.00	0.99
Flash point	190° F.	120° F.
Engler viscosity: First, 50 cc	155 sec.	75 sec.
Second, 50 cc	170 sec.	90 sec.
Weight (increase 2.96 per cent.)	855.1 grams.	983.6 grams.
Volume (increase 4 per cent.)	955,1 cc.	993.5 cc.

While asphalt and sand mixture were used in these tests, being more convenient than coarser bituminous mixtures, it is not intended to claim that one bituminous paving mixture is more readily affected by gas exposure than another.

To practical road engineers and road builders the important question is, "What are we going to do about it?"

In my 30 years' experience with asphalt and other bituminous pavement construction, this matter has come up many times, and generally the gas companies claim:

1. That it is ridiculous to suppose that gas will attack an asphalt pavement.
2. That the gas mains have been carefully tested by plugging holes through the pavement and into the ground; and that there are no leaks.
3. When the main is on the side of the street opposite a portion affected, it is too far away.

I would comment on these points as follows:

1. There can be no question but that coal gas, being a hydro carbon in gaseous, and therefore its most penetrating form, will attack any form of bitumen even more rapidly than oil, just as gasolene, being more penetrating, will attack bitumen more rapidly than heavier oils. I remember an aggravated case on West End avenue, New York city, about 15 years ago, which became affected, and the asphalt pavement again ruined within 3 months after it was resurfaced; the gas company having claimed that they had thoroughly tested the mains and repaired the leaks. Shortly afterward the gas company was obliged to entirely relay its main and the pavement was again relaid.

2. Even if they will not admit it, the gas companies know that the "plugging" test only sometimes locates the leaks. They naturally dislike to go to the expense of tearing up and relaying pavements and excavating to the mains, unless they are absolutely required to do so.

3. Leaking gas follows the lines of least resistance; which may be in either a nearly vertical line, showing the result almost immediately above the leak, or may follow a long distance through a vein of porous earth, or along some old settled trench and reach the pavement surface a long distance from the leak. In such cases the pavement is generally affected over a large area, because the earth has become quite generally saturated with gas, which gradually works up to the pavement surface.

Frequently, if not generally, the first indication of leak in the gas main where the street has a bituminous pavement, is the effect on the pavement; in which case it is good fortune that the pavement is of a character which is affected by gas and will permit the gas to permeate the surface, thus lessening the chance of serious casualty.

The visible effect of leaking gas on a bituminous pavement is a serious "shifting" or "rolling" of the pavement in its softened condition, accompanied by a breaking up of the surface into a "crackled" appearance not unlike the folds in an alligator's back. Generally, when this condition is noticed there will be a perceptible odor of gas, but sometimes the leak may have been repaired or the gas taken another course and escaped so that its odor cannot be detected; yet the pavement is left in a seriously damaged condition. On the other hand, under certain subsoil conditions, the earth below the pavement may retain the escaped gas and continue its damaging effect for months, if not years, after the gas main has been repaired.

The effect on the pavement may extend for a considerable period after the repairs to the gas main, unless vents are left open for several days, if not weeks, after repairs to the mains are made.

In such cases, before repairing the pavement, its entire surface over the main and where the surface shows the effect of gas, should be removed. After the leaks are repaired, openings at least a foot square, extending from the surface to the level of the gas main, should be left open for 2 or 3 weeks if there is still any odor of gas, and the openings then refilled, and the pavement surface relaid.

In conclusion, it may be well to call attention to a pernicious but quite general custom of the gas companies in their "hunt" for leaks. I refer to the custom of having two or three men, one of them selected for his "smelling" efficiency, go along the street, where there are indications of gas leaks, hammering a cone-shaped bar through the pavement into the ground below. These holes are made at intervals of a few feet. The "smeller" puts his nose to the holes and if he discovers a sufficient odor of gas to attract his attention, an opening is dug to try to discover the leak. If the "smell" test does not locate a leak apparently below the hole, it is filled with dirt. A few weeks later the city official, or the paving contractor, if he happens to have the pavement under "guaranty," finds serious holes along the center line of the pavement, and not being able to trace the trouble he makes the repair, if his "guaranty" is good, or "lets it slide" if he and his "guaranty" are no good, and perhaps at end of a law suit the city makes the repairs. The simple, but so far as the writer knows, never enacted cure for this evil is an ordinance requiring gas companies, whenever they want to test their mains, to cut openings of sufficient size through the pavement to enable excavation to the gas mains, prohibiting the promiscuous drilling of holes through the pavement, and to pay for making a proper repair to the pavement. With the enactment and enforcement of such ordinances the chances of locating the leaks are greatly increased and the unfairness to the city and contractor of making holes in the pavement without adequately repairing them will be eliminated.

Outdoor Gas Lighting in a Small City.

[Prepared by J. B. JONES, for the New Jersey State Gas Association.]

The subject of Outdoor Gas Lighting is one in which most of the gas companies of the State agree in general particulars, but the way of securing and holding this business appears to be a local proposition entirely. From correspondence with various companies in the State, I found that they were generally agreed that outdoor lighting was not only desirable, but profitable business; and that they made special effort to secure it. The lamps preferred are almost, without exception, the well known Humphrey and Welsbach types. Gas was being sold on a meter basis in every instance, except at Atlantic City where they have an attractive installation of boulevard posts for Commercial lighting. And it may be said at this point, that this investigation covers only Commercial Lighting.

The companies who have gone after this business, maintain the lamps wherever they can secure contracts to do so. The mercury valve for distance lighting has apparently found favor with all of the companies, and the recently introduced Nitro-electric lamp has stimulated outdoor gas lighting, rather than taken any of the business away from the gas companies. Such is, in effect, the general practice in the State, and what I further say applies to our local experience entirely, and I do not wish the members to feel that I am presuming to offer suggestions as to how they shall handle this business.

Securing Business.—Our first outdoor gas arc was installed about 5 years ago. It was a 4-light upright Humphrey, and it is still doing service, although not in the same location, having been replaced later by a No. 50 inverted. It illustrates the point, however, for we have been lighting that store front since our first installation of a gas arc. We went after that consumer with the idea of giving him good service, even if his was the only outdoor arc lamp we were going to install in the city. Since that time we have installed, and now have burning, 180 outdoor arcs, and we endeavor to give them the same care that we did the original installation. Our plant is located practically in the centre of the district which we supply, reaching a population of about 12,000, and at no point have we an arc lamp that is more than a mile from the plant. This gives an idea of how fully we have the city covered, and how quickly a lamp can be reached in case of complaint.

Installation.—We install the lamps on a basis that may seem strange to you, in that we have no contract, do not ask for any, and have never had any difficulty. It is a sort of honor basis between the consumer and the gas company. We secure the consumer's consent to place the arc lamp. If it is satisfactory, he pays us $4 a year for rental and maintenance; if not, we remove lamp upon request. The gas company owns the lamp, makes the installation entirely free, and the consumer is under no obligation nor does he run any risk. We find the plan works satisfactorily and that we can afford to maintain the lamp for that price.

The average cost of maintenance per lamp last year was $1.20 for mantles, $1 for labor, and $1 for glassware and small repair parts, leaving a balance of 80 cents which we allowed for depreciation, and with our local experience, I believe that will be ample, since we have never yet thrown a lamp away. Lamps showing signs of wear are brought to the shop, supplied with new parts, and installed again.

We endeavor to make the installation along the street uniform, hanging the lamp so that the bottom of the globe is 8 feet from the sidewalk, and wherever possible 3 feet from the window. A direct supply line, 1 inch or 1¼, is run from the meter when it is possible. At night they present the effect of even light distribution on the street, although the lamp is installed to meet the special needs of each consumer. No attempt has been made to secure freak lighting, and there is not a single installation of that kind in the city. We went after the small merchant, the man with a store front that one lamp would

take care of, and when we secured his business tried our best to hold it.

As a result, we secure an average of 5 hours burning on every outdoor arc installed. The stores do not all use the lamps 5 lighting hours, but pool rooms, restaurants, etc., give us 7 to 8 hours burning. Figured on the most conservative basis, this allows us a consumption of 60 cubic feet of gas per night for each lamp, or with our total number at least 10,000 cubic feet per night; and allowing that the lamps burn 300 nights in the year, and making no account of the holiday season, street celebrations, etc., when we secure later burning hours, our outdoor lighting business gives us a consumption of 3,000,000 cubic feet per year. This may not seem enough consumption to talk about, but when you consider that the lamps are paying their way; that we do not have to lay a single foot of street main or install any extra meters, and that the lamps are a constant advertisement of gas service, and have helped to secure indoor arc lighting, it is a factor of some consideration for a small company.

Maintenance.—One man looks after the maintenance of all lamps, and does nothing else, we having besides the 180 outdoor lamps, about 600 indoor arcs, and nearly 200 single-mantle burners. Our company has adopted the Humphrey Arc Lamp exclusively for the 3 and 5 mantle burners, and the Welsbach lamp for the single mantle type; using Welsbach mantles on both arc and single burners.

The rate of $4 per year is charged whether it is a 3 or 5 mantle lamp, and $2 for a single burner. Collections are made in the middle of the month by the same man who cleans the lamps; and cover only 8 months, we making no charge for the months of May, June, July and August. This plan has worked satisfactorily, as it keeps the lamp maintenance bill away from the gas bill period; and by making no charge in the summer, we have secured business that could not have been obtained in warm weather.

Inspection.—Every lamp is visited at least three times a month, and, where the lighting hours are very long, the lamp man calls at least once a week. One night each week—usually Saturday—the lamp man and one of the fitters makes an inspection of every lamp in the business district, and if a mantle is needed or a globe has been broken they make the repairs at once. This saves the "Monday morning" complaint and pleases the consumer, who does not like the loss of his light on the busiest night of the week. Once or twice each month the men take an automobile and visit every lamp in the city. This gives them an idea of the service the lamp is giving, and uncovers a lot of new business.

All outside pipework is painted to harmonize with the building front, and is kept painted by the company. The pipefitters usually do this work, and they go over the pipework on all outdoor installations at least once each year.

Neighborhood Results. — A considerable part of the long-hour burning for outdoor lamps was secured from the small corner groceries, of which in a city our size there are many. It may be the front room of a residence, or a small addition—the kind of store that depends upon a limited patronage in a residential district We would go to such a storekeeper and, telling of the service we had to sell, giving actual cost figures, and show him he can advertise the fact that he was open for business, at less than $2 per month; and we usually were successful in landing the order. If this did not do, we went back at night and induced him to walk a block down the street with us and see if he could tell whether his store was open or closed. After the first few installations it was easy to take him a couple of blocks and point out some store where an arc was shining. It was easy after that to work up sentiment in the neighborhood, and it soon became a sign that when the light was out that store was closed. It saved customers in the neighborhood useless steps, brought more business to the storekeeper, and brought gas-lighting to the attention of the neighborhood. In residential neighborhoods the storekeeper has to keep a supply of quarters on hand for prepayment meters, and he makes many a small sale to persons who want a bill changed to get money for the meter. Our collectors, when they make their rounds, usually leave from $20 to $30 in quarters with these storekeepers, and you generally find them to be pretty good friends and "boosters" for the gas company.

Depreciation.—Both the General Gas Light Company and the Welsbach Company have helped greatly in keeping our lamps from depreciating. With their system of repair charts, and the promptness and willingness to send small repair parts, we have been able to make old lamps into new—not as Aladdin did, but by careful attention on the part of our men, backed with the excellent service of the two companies named. It is one thing to secure outdoor business, and another thing to keep the lamps burning; and I am convinced that only the most careful attention to the needs of the consumer will do this. When a lamp becomes rusty-looking we put another in its place, and in our spare time give it a complete overhauling; and we find that most customers are pleased when the gas company hangs a new lamp for them.

We secured an installation of 27 Humphrey Indoor Arcs in a canning factory this summer, because the owner wanted a light as good as one we had burning each night on the street near our gas holder. Thus far he has burned 2,000 cubic feet every day. This was new business, and not secured because we sold gas at $1 per 1,000, or because the electric company sold current for 10 down to 4 cents per kw.-hour, but just because a light placed for our own convenience in the street near our plant, had attracted this man's attention. It is true that he only burns gas 5 months in the year, but he burns it nearly 18 hours of the 24. We displaced electric lighting, and satisfied not only the canner, but all of his two hundred employees.

From this instance alone, we are satisfied that Outdoor Gas Lighting is not only profitable directly, but that it helps the gas business generally.

Domestic Use of Gas.

[Prepared by B. S. PEDERSEN, for the Twenty-second Convention, Pacific Coast Gas Association.]

To state that we have reached any marked degree of efficiency in the domestic use of gas would be misleading and contrary to the facts. We are still groping in the early dawn of endeavors in our application of gas for that purpose. And yet, when we consider that only during the past 25 or 30 years have any efforts been made in that direction, we are forced to admit that the gas industry has awakened, and we applaud the results already obtained. That we are far from our ideal however, both as to service and appliances must be acknowledged by all, even the youngest among us. It is our aim to make a 100 per cent. business, both in service and in results, nor must we be satisfied with less.

That we are not further advanced in the science of gas application to household use is chargeable in great measure to the natural condition surrounding the industry from its inception. It was looked upon as a science, not a business; its product a luxury, not a necessity. Such being the case, the cost to consumers was of small moment, so long as satisfactory results were obtained by the investors in gas securities. Gas was far superior to the tallow dip and the oil lamp, and it was a mark of "class" to use gas, apparently distinguishing the user from the common herd. Many of us can remember, as boys, reading ads. of houses for sale or rent where special attention was called to the fact that gas could be used for lighting, in addition to having running water and sanitary appliances in the house. Considered as a science, the industry had made great strides in improvement of methods of manufacture, purification and storage, principally the two former, and also in the apparatus concerned therewith. So far as the public was concerned, they could by proper application become consumers, a good deal like joining a club or secret society. With the introduction of electricity this industry, built on such apparently solid foundation, was overnight threatened with destruction. The people who were what might be termed gas "aristocrats" became users of electricity, relegating the old light to a secondary or auxiliary position. This to the serious discomfort of the perturbed directors of gas companies, and diminuition of dividends to the vanishing point. The saying: "Necessity is the Mother of Invention" was verified at this time. If the gas industry was to survive, other means of utilization must be found. The Bunsen burner, having been used before this in laboratories, was suggested for cooking, and gradually the gas hot plate and gas range were devised enabling the industry to branch out and secure a new line of business. Here, however, was no monopoly and the industry was forced into commercialism. We have met coal and wood as competitors and they are ours. The Welsbach lights gave us an opportunity to regain a share of the lighting business, so that now we admit that the introduction of electricity was a blessing to our industry, and until recently we have averaged pretty evenly with our electrical competitors. And now I shall make a statement that will no doubt surprise a good many, and I hope will afford an opportunity for discussion. It is this: At no time has the gas industry shown any sign of initiative or originality along commercial lines. Every move made has been forced by competition, or conditions over which

they had no control. In the first place, is it within you to imagine that we would to-day be cooking with gas but for the advent of the electric light? Do you think for a minute that automatic water heaters would be universally used if it were not for the tremendous efforts of the inventor and manufacturers? Any assistance the manufacturers have received from gas companies have been given grudgingly and sparingly. It has been necessary to get them against a wall and make them fight for their lives in order to arouse them to the efforts necessary to maintain themselves as commercial factors. This condition of affairs is absolutely wrong. The gas companies should be originators of improvements. They have and are maintaining engineering corps, carrying on extensive experiments in their laboratories in an earnest endeavor to reduce the cost of their product and improve its quality. But where is there a company maintaining or conducting an experimental station to improve the quality or efficiency of gas appliances? If there are any, they are keeping it quiet. On this coast I have not heard of any, though I have been here 17 years and have visited practically every gas works many times. This is not "Jeremiah's Lamentation" but the opportunities appear so great that if I can awaken you to an appreciation of them I would lament, if necessary, another 17 years. Thirty years ago, the gas range as a consumer of gas was designed. To-day, it is practically the same article, and the same generous disregard of economy is displayed. The only changes have been in the matter of convenience, not efficiency. The cook lady may now do her cooking on a range and look after it without standing on her head, may have a glass door on the oven, and an enameled splasher; or have the range enameled inside and out. But how much less gas does she use than 30 years ago to accomplish the same amount of work? Economies have been effected in lighting. Two lights may now burn on the same quantity of gas that formerly one jet consumed, but in the range we still consume as much gas as we did when it was first put on the market. Does it not look as if we have fallen into a rut, just like we were before the advent of electricity? The electricians gave us a shock at that time, and from all appearances they are about to shake us up again. They are after domestic cooking and heating business, and unless we are ready for them they will gain an advantage that it will take years to overcome. They already have on the market appliances that will bake and boil food as well and as cheaply as it can be done with gas. That these appliances have not as yet largely displaced gas is not so much the fault of gas companies, as it is the incomplete or imperfect construction of the appliance. But do not think they will not overcome these mechanical defects, and when they do, they will not show any nice distinction of professional ethics, but will go after the business good and strong.

Manufacturers of gas appliances are making ready to meet this new competition by radical departure from the old type of gas range. This will take the form of an apparatus built to conserve the energy now wasted by utilizing the heat units now lost by radiation; an apparatus that will utilize from 50 to 75 per cent. of the heat energy expended, instead of the 25 to 30 per cent. as on the present so-called modern gas range. It was my hope to have on exhibition a range to illustrate this, but I was unable to get one here in time. Within a short time there will be on the market this new type of range which will double present efficiency, and with it we expect to be able to meet electrical competition for a time at least. Do not, however, be deluded into thinking that this will eliminate the electric man, and that we may now take it easy. He is ever alert and continually improving his appliances, and we must continue along the lines started in order to keep the advantage. Always bear in mind that every improvement we make in appliances saving the consumer one cent will return to the gas company dollars in dividends.

Another department of domestic use of gas is space or room heating. Probably no department has received less attention from the fraternity than domestic heating. It has been deemed sufficient, until recently, to place small open blue or white flame heaters in a room to "take the chill off." It apparently never entered the mind of the salesman that he was actually disparaging the use of gas—first by the temporary installation, and then his apologetic attitude virtually admitting that gas heating is a makeshift. If that was not sufficient, the open heater allowing the products of combustion to escape into the room, would surely finish the job; and though good gas consumers might have been created, a confirmed coal or wood user has been made. And mind you, the individual will pay several times the amount for a coal or wood stove that you ask for a gas stove, and he will properly flue it so that the products of combustion are conducted into the chimney where they belong, and not into the room where they are a menace to the health of the occupants. There are gas heaters on the market constructed to comply with all the laws of health and efficiency, but they are not in general use, nor will they be until gas companies carry on a campaign of education. This can not be done by the manufacturers. They can furnish you with the proper article, but you who deal direct with the consumer can and must bring this home to him, Your reward will be doubling your consumption per mile of main. How many of you realize what that means?

Every consumer having a gas range, and using a house heater as well, burns gas 10 to 12 hours each day. That is the day load our electrical friends are after, and it is what you should have. If you stop to figure cost we, here in California, are particularly well favored, coal and wood being comparatively high and gas generally low in price. Conditions favor us in every way, and, with the same mental and physical activity that the other fellow puts forth, we would leave him so far behind that he would never catch us. Before closing, I wish to give you a little food for thought. It is a sad commentary on the gas man, and incidentally the industry, that 90 per cent. of the gas companies of the state are controlled and managed by electricians. Some never saw a gasworks until they were given the management of it. These men are usually electricians at heart, and must be educated to see the possibilities in gas—not as a side issue, but a main factor in their company's prosperity, and one that will give as great, if not greater, return for the same effort as electricity. With the same attention to men and means by the gas companies that our competitors apply, there should be no occasion for calling on our electrical brethren to manage gasworks. Happily, this is being taken up by the larger companies, so that we may hope to have trained gas men to serve the public and company to the satisfaction of both, for, in the last analysis, it is only through satisfied consumers that it is possible for a company to obtain any degree of satisfaction and profit. One of our commercial bodies has adopted a motto which, I think, should be impressed upon the mind of every member. It is a sermon in six words—"He profits most who serves best."

Steam as a By-Product of Internal Combustion Engines.

[From an Address by J. B. MERIAM, M.E., Before the Cleveland Engineering Society.]

In any water-cooled internal combustion engine there is a loss of heat through the cylinder walls into the water jacket. The distribution of total heat is about as follows:

Effective work	27	per cent.
Radiation	3	"
Exhaust losses	38	"
Water jacket losses	32	"
	100	"

When the engine is fully loaded the exhaust gases leave the cylinder at about 1,100° F., and it is safe to say that, during the power stroke, the average temperature within the cylinder will be about 2,000° F. Heretofore it has not been considered allowable to carry the temperatures of the water leaving the jackets of larger engines much above 150° F. Since difference in temperature is the heat potential, or tendency to flow, there should be no extreme difference in the flow of heat or cooling effect upon the 2,000° within the cylinder to the water in the jacket, whether the water temperature is 150° or 250°. Other things being equal, the cooling effect is directly proportional to the difference in absolute temperatures. With the figures assumed above, the ratio of cooling effect between carrying the engine jacket water at 150° or at 250° is as 100 to 2,463, or less than 5 per cent.

The fact is, however, that with ordinary water supply an engine will work satisfactorily at 150°, but if the temperature of the water in the jackets is allowed to rise, the cylinder or piston will burn or score before the jacket water reaches 250° F. The purpose of this article is to show that "there is a reason" for this seeming ill-effect; and further, that by the application of a certain process, this effect becomes a valuable asset.

As an illustration of difference in temperature, consider that we have two houses at the foot of a mountain, one located 100 feet above the other, and supplied with water from a common reservoir 2,000 feet above. Now, if we had a good flow of water in the lower

(*Continued on page* 330.)

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NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, NOVEMBER 23, 1914.

[Official Notice.]

Gas Exhibit Committee, American Gas Institute.

St. Paul, Minn., November 5, 1914.

The American Gas Institute appointed the undersigned committee to advance the interests of the gas industry at the Panama-Pacific International Exposition at San Francisco in 1915. The committee has secured from the exposition officials an adequate classification of the varied industries of gas manufacturers, so that intending exhibitors of merit will receive proper awards and medals, the classification being much superior to that in effect at the time of the Universal Exposition at St. Louis in 1904, and more nearly represents gas manufacture to-day.

An opportunity is thus offered manufacturers of gas goods and appliances, and articles of every description used and useful in the gas industry, to exhibit at San Francisco, and a cordial invitation is extended them to make the most of the opportunity presented. Now is the time for American manufacturers to show to the world the value of the label, "Made in the U. S. A." "U. S." has been referred to as meaning US—that is, the people of the United States—and San Francisco will be visited by thousands of gas men from all parts of the country, as well as by the foreign gas men who will come for the International Gas Congress. Progressive gas manufacturers cannot afford to default in this unique opportunity.

It is expected that the exhibitors at the National Commercial Gas Association at Minneapolie will arrange for the transfer of their exhibits to San Francisco.

This is a special invitation to you to join in the movement, and your co-operation is urged.

The undersigned will be glad to answer inquires:

E. G. Cowdery, Chairman, Peoples Gas Light and Coke Co., Chicago.

J. M. Morehead, Secretary, Peoples Gas Light and Coke Co., Chicago.

E. C. Jones, President, American Gas Institute, care Pacific Gas and Electric Co., San Francisco.

O. N. Guldlin, Western Gas Construction Co., Fort Wayne.
O. O. Thwing, Western Gas Construction Co., Fort Wayne.
T. D. Miller, Consolidation Coal Co., Chicago.
W. A. Baehr, Peoples Gas Building, Chicago.
Paul Doty, St. Paul Gas Light Co., St. Paul, Minn.

BRIEFLY TOLD.

Program of the National Commercial Gas Association Convention: Minneapolis, Minn., December 1, 2, 3, and 4.

Tuesday, December 1st.

Morning Session, 10 to 12:30.

Address of Welcome by Hon. Wallace G. Nye, Mayor of Minneapolis. Responded to by Mr. E. N. Wrightington, Vice-President Boston Consolidated Gas Company.
Address by Mr. James J. Hill. Responded to by Mr. Thomas N. McCarter, President Public Service Corporation of New Jersey.
Roll Call and Reading of Minutes.
Report of Board of Directors.
Report of Treasurer.
Report of Finance Committee.
Report of Committee on Amendments to Constitution
Report of Committee on Public Policy.
Report of Committee on Membership.
Report of Committee on Local Sections.
Address of President.
Report of Nominating Committee.
Report of Time and Place Committee.

Afternoon Session, 2 to 5.

Report of Committee on Relations with Customers, by R. R. Young.
Report of Committee on Standardization of Gas Appliance Specifications, by O. H. Fogg.
Report of Committee on Salesman's Handbook, by H. D. Gillingham.
Report of Board of Educational Control, by Robert Ffrench Pierce.
Report of Committee on Window Display (illustrated), by J. P. Zingg.
Report of Committee on Booklets, by J. A. Norcross.

Wednesday, December 2d.

Morning.

There will be no regular general session in the morning. The Exhibition Hall will be open to members, however, and all the delegates are requested to inspect the exhibits.

The Industrial Fuel Committee will hold a special session from 10 to 12:30 in the Convention Hall at the Armory. (See program below.)

A special meeting of the Publicity Committee will also be held between 10 a. m. and 12:30 p. m. in the Ball Room of the Radisson Hotel. Members interested in advertising or the publicity end of the business should attend.

The Educational Committee will also hold a special session in the Empire Room of the Radisson Hotel from 10 a. m. to 12:30 p. m. Dr. Galloway will preside.

Afternoon Session, 2 to 5.

Paper, "How to Select, Train and Hold Your Selling Force," by C. H. French.
Report of Committee on Publicity, by R. C. Fowler.
Report of Monthly Bulletin Committee, by J. L. Conover.
Address, "Direct Advertising as Applied to the Gas Business" (illustrated), by Alan R. Fernald.
Report of Committee on National Advertising, by C. W. Hare.

Thursday, December 3d.

Morning Session, 10 to 12:30.

Paper, "Securing and Retaining Residence Lighting," by W. A. Morris.
Report of Committee on Indoor Lighting, by Sidney Mason.
Paper, "House Maintenance Service," by Arthur Hewitt.
Report of Committee on Heating, Ventilation, and Refrigeration, by George S. Barrows.

Afternoon Session, 2 to 5.

Paper, "How to Secure All-Gas Kitchens in Old Houses," by H. K. Dodson.
Report of Committee on Domestic Fuel Appliances, by J. J. Burns.
Report of Committee on Outdoor Lighting, by A. P. Ewing.
Paper, "Accounting," by A. P. Post.
Report of Committee on Accounting, by J. D. Shattuck.

Friday, December 4th.

Morning Session, 10 to 12:30.

Report of the Committee on Development of Industrial Fuel, by H. O. Loebell.
Report of Committee on Differential Rates, by F. W. Frueauff.
Report of Committee on Central Development, by R. C. Ware.
Report of Committee on Motion Pictures, by W. J. Clark.
Report of Manufacturers' Committee, by C. V. Roberts.
Report of International Committee on Commercial Advancement, by Arthur Hewitt.

Afternoon Session, 2 to 5.

Discussion on preceeding papers; and presentation of papers not read at the regular time assigned.

INDUSTRIAL FUEL SESSIONS.

Wednesday, December 2d.

At Convention Hall, the Armory, 10 to 12:30.

Possibilities of the Development of Industrial Fuel from the Commercial View Point, by J. M. McMillin.
Gas Fired Steam Boilers, by C. E. Chapple.
High Temperatures and Artificial Gas, by E. R. Rosen-Baum.
Flame Temperatures, by C. L. Henderson.
China and Glass Kilns, by T. D. Keyes.

In Ball Room, Radisson Hotel, 2 to 4:30 P.M.

Railroad Shop Equipment, by W. F. Clausen.
Carbonia Treatment, by B. B. Yeomens.
Brass Melting, by E. F. Davis.
Brass Melting, by O. H. Gindele.
Brass Melting, by P. F. Reichhelm.
Forging, by W. G. Phelps.
Converting Core Ovens to Gas, by E. J. Burke.
Brazing, by C. E. Chapple.
Pyrometers, by R. T. Brown.

Thursday, December 3d.

In Ball Room, Radisson Hotel, 10 A.M. to 12:30 P.M. and 2 to 4:30 P.M.

Results of a Campaign on Industrial Fuel, by L. Gaston.
Hotel Business, by Mr. Hawkins.
Hotel and Restaurant Burners, by Ivan A. Hay.
Hotel and Restaurant Ranges, by E. K. Slater and H. D. Gillingham.
Syphon Blast Hotel Ranges, by Samuel C. Bratton.
Recovering Heat from Flue Gases in Hotel Ranges, by J. L. Meyfarth.
Surface Combustion Broilers, by Russell E. Sard.
Butcher and Packing House Equipment, by W. T. Hudson.
Coffee Roasting, by A. H. Gindele.
Changing Dutch Ovens from Wood or Coal to Gas, by J. B. Redd.
Laundry Irons, by H. C. Russ.

ILLUMINATING ENGINEERING SOCIETY.—At the meeting of the Council of the Illuminating Engineering Society in New York City Nov. 12th, the Committee on Lighting Legislation presented a report covering the laws of New York, Pennsylvania, and Connecticut pertaining to lighting. The transcript of the laws of New York and Pennsylvania cover the equivalent of fifty typewritten pages each, but the references to lighting are, with few exceptions, very general in character. In many cases the regulations are included in laws covering other topics, such as ventilation, etc. The laws relating to lighting in the State of Connecticut cover only one typewritten page and contain only general requirements. A digest of these transcripts is in preparation. It has been decided to discontinue at present the plan to collate the lighting laws of other states, with the exception of the compilation for Illinois, which is under way. The committee has also considered the "General Orders" of the Industrial Commission of Wisconsin, which form the basis of the industrial lighting regulations of that State, and which are subject to modification from time to time at the option of the Commission. The feasibility of formulating a model lighting law for adoption by various states was considered, but the proposal was thought impractical at the present time. However, as a step toward meeting the situation, it was decided to formulate a "Lighting Code" on school lighting, and another on factory lighting, and this work is under way.

This committee acts in an advisory capacity with governmental authorities, whenever the enactment or revision of laws pertaining to lighting is concerned. The Factory Investigation Commission of New York has had incorporated in a law relating to the lighting of factories and work rooms the recommendations submitted by the committee.

The following appointments were announced: Committee on Popular Lectures, C. E. Clewell, Chairman; W. S. Franklin, H. E. Ives, R. F. Pierce, A. J. Rowland, G. A. Sawin: G. C. Keech, Chairman Sub-committee on Industrial Lighting; A. L. Powell, Chairman Sub-committee on Store Lighting; E. R. Treverton, Chairman Sub-committee on Office Lighting; E. J. Edwards, Chairman Sub-committee on Residence Lighting. For more than a year this committee and its sub-committees have been gathering data and information to be put in the form of six popular lectures on lighting. One lecture will deal with the general principles of illumination, and the other five with residence, office, industrial, store and school lighting respectively. In all the lectures the principles of good lighting will be reduced to a simple and attractive form.

Seven applicants were elected members of the Society.

The following additional committee appointments were confirmed:

As members of a joint committee of the Illuminating Engineering Society and the American Ophthalmological Society on the Illumination of Test Types: P. W. Cobb, Chairman; P. G. Nutting and J. R. Cravath.

School Lighting Committee.—M. Luckiesh, Chairman; F. Park Lewis, M. G. Lloyd, S. G. Hibben, R. B. Ely, C. A. Littlefield, C. E. Clewell and F. K Richtmyer.

Papers Committe.—S. G. Rogers and Alexander Duane.

Lighting Legislation Committee.—C. O. Bond.

Committee on Education.—F. K. Richtmyer, Chairman; Preston S. Millar, H. E. Clifford, A. E. Flowers, A. H. Ford, H. G. Hake, E. B. Rowe, C. F. Scott, L. B. Spinney, A. N. Topping, W. E. Wickenden and H. B. Dates. This committee has undertaken to ascertain the status of illuminating engineering in schools and colleges throughout the country, and to foster the establishment of courses that will ultimately lead to the Degree of illuminating engineer.

Section Development Committee.—C. A. Littlefield, Chairman; C. L. Law, O. L. Johnson, S. G. Hibben, S. C. Rogers and L. B. Eichengreen.

Committee on Progress.—F. E. Cady, Chairman; T. J. Litle, T.W. Rolph, L. B. Marks and P. W. Cobb. This committee will prepare a report to be submitted at the next annual convention.

Sustaining Membership Committee.—C. A. B. Halversen, Jr., W. H. Rolinson, S. L. E. Rose, S. G. Hibben, E. B. Rowe and G. S. Barrows.

Committee on Nomenclature and Standards.—P. G. Nutting, W. A. Dorey and W. E. Saunders.

Exhibition Booth Committee (Gas).—Thos. W. Scofield.

Executive Committee.—A. S. McAllister, Chairman; L. B. Marks, C. A. Littlefield, J. Arnold Norcross and Preston S. Millar.

The following representatives of the Society to the United States National Committee of the International Commission on Illumination were confirmed: Louis Bell, Preston S. Millar and J. R. Cravath.

Dr. Clayton H. Sharp was appointod a representative of the Society to the Standards Committee of the American Institute of Electrical Engineers.

Mr. S. G. Hibben was appointed a director to fill the unexpired term of Mr. F. A. Vaughn, who resigned on account of his election to the vice-presidency.

Mr. Alten S. Miller was appointed a director to succeed Mr. V. R. Lansingh, resigned.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.—The first mid-year meeting of the Association will be a two-day session in Albany on December 10th and 11th. The meeting will begin with a session at 2 o'clock on Thursbay. Thursday evening the delegates will dine together informally, and there will be two sessions Friday, one in the morning and one in the afternoon.

The principal subject for discussion at the Thursday session will be "The Handling of Complaints," either of service or on bills. In the opinion of many, this matter is as important as any other feature of the public policy of a company. In many cases it has been sadly neglected; and in others, the methods are crude and inadequate. Other points more or less closely related to this subject will be discussed.

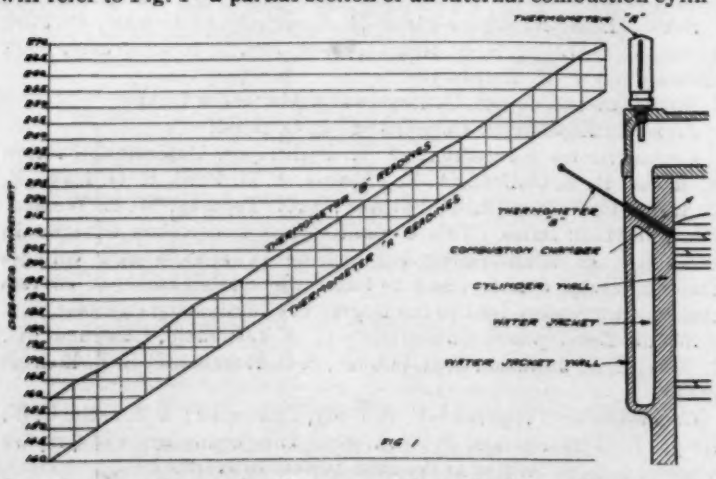
The discussion may continue into the session of Friday morning; but it is planned to have one session which will be open for any matters which members may decide to bring up, as it is felt that there are subjects which, while they may not require an entire meeting, could be advantageously considered.

In order to get a line on questions that may be presented, and that others may be prepared to speak on them, it is requested that in sending in the reply postal members will note on it points that they care to bring up at the meeting; and that they do so promptly so that a list of subjects can be sent out in a later letter to members.

NEW YORK SECTION, "GAS MEETERS."—The November dinner of the New York "Gas Meeters" was held on Thursday last at the Dunn Building Restaurant, Broadway and Reade Street. Weather conditions interfered materially with the attendance, but those who braved the rain had no regrets. Mr. W. J. Clark was the guest of the evening, and his remarks were, as always, listened to attentively but often interrupted by laughter. Others who spoke were Thurston Owens, B. Kay Johnson, J. D. Taylor, Jr., J. M. Brock and E. H. Crowhurst. The entertainment feature had to be seen to be appreciated, and we were asked not to describe it. It is sufficient to say that there was something doing every minute, except in the rests, and the last —— —— wasn't finished until about 10:30. Announcement was made that there would be no meeting in December, the next dinner to be in January.

(*Continued from page 327.*)

house, and but little in the one 100 feet above, we would at once conclude that the pipe was obstructed somewhere. To find the similar stoppage or interference with the flow of heat in the gas engine, we will refer to Fig. 1—a partial section of an internal combustion cylin



der, showing the combustion space, the cylinder wall, the water jacket, and the jacket wall. Let us first put down a statement of the elements which effect the flow of heat from the surface of the combustion chamber to and into the water. We have—

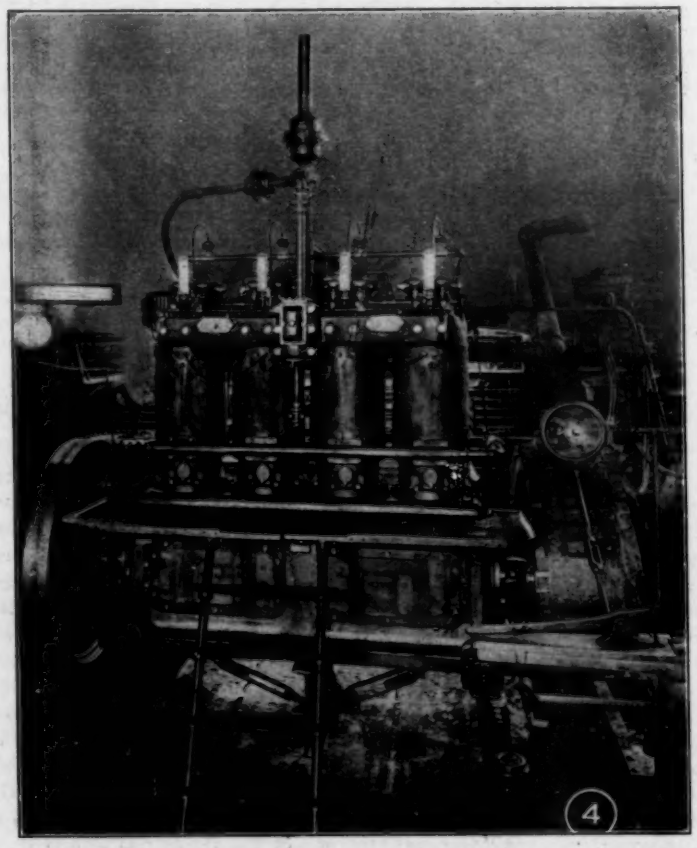
1. The difference in absolute temperature, or the relation of the two temperatures to absolute zero.
2. The amount of surface exposed.
3. The time of the exposure.
4. The unit of resistance to the flow of heat.

Analyzing these in the order stated, we find that the difference in absolute temperature is measureable, but, as in the case of the water pressure in the houses, is not sufficient to cause the disastrous interference with the flow of heat which takes place somewhere between the surface of the combustion chamber and the water. The amount of surface is a very important consideration in engine design, but after the engine is built it is a constant; that is, the area of surface is the same whether the temperature is 150° or 250°. Similarly with the third element; after the revolutions of the engine have been determined, the time of exposure of the cylinder walls to the hot gases becomes a constant. In none of these three elements, then, do we find a reason for any great change in cooling effect between using water at 150° or 250° F. We must then consider the fourth element, with the conviction that there must be some critical change in the *resistance* to the flow of heat as the temperature of the water rises above 150°.

If we take an iron kettle (Fig. 2) containing water and a thermometer, and build a fire under it, it will be found that no visible change in the water takes place below 140° F., but that above 150° there occurs (what we have all often observed) the formation of small bubbles which adhere to the surface of the iron. It will be further observed that these adhering bubbles increase in number and in size with rise in temperature, and that by the time the water has reached 200° the inside surface of the kettle seems fully covered with bubbles. Here is the secret of the action: By closer inspection it will be seen (Fig. 3) that each bubble spreads out into a broad base where it it in contact with the iron surface, and it is evident that wherever there is a bubble adhering the water is not in contact with the iron, the bubbles acting as insulators. The bubbles increase in size and finally break away at the neck, and a new bubble forms on the spot—which is somewhat hotter than the metal surrounding it, that has been in contact with the water. If we stir the water in the kettle so as to put it in motion, we find that the bubbles break off while much smaller. In short, we find that the size of these bubbles decreases as the velocity of the water increases.

A similar formation and adherence of bubbles takes place in the cylinder jacket of the internal combustion engine and constitutes a critical interference to the flow of heat or cooling effect of the water, causing the disastrous rise of temperature on the inside surface of the cylinder.

A series of tests were made on a 150 horse-power engine shown in Fig. 4, and the results were most extraordinary. The engine—a four-



cylinder 12 14 x 14″ Bruce Macbeth design—was fully equipped with thermometers, flow meters and gauges. A centrifugal pump (Fig. 5) was used to force the water at high velocity through the cylinder jackets, from which it passed to an inclosed tank, which was in turn

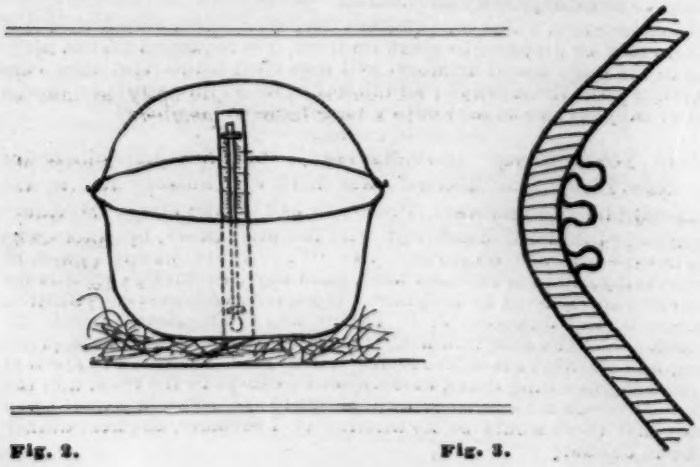


Fig. 2. Fig. 3.

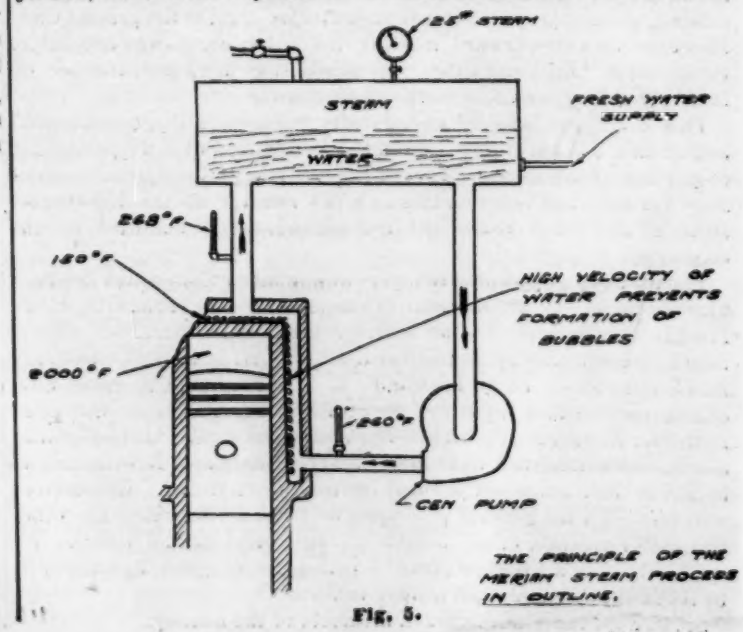


Fig. 5.

connected to the suction side of the centrifugal pump. The velocity of the water was from five to ten times that ordinarily used.

It is important to know the effect of the high temperature jacket water upon the temperature of the metal close to the inside wall of the cylinder. For this reason a cylinder was provided with a boss as shown in Fig. 1, and a $\frac{9}{16}$ inch hole drilled to within about $\frac{1}{16}$ of the inner surface. A drop of mercury was placed in this hole and a thermometer, *B*, inserted. A second thermometer, *A*, was in the jacket water. It is desired that the temperature of the inner surface of the cylinder wall, as recorded by thermometer *B*, should not exceed those common in steam practice. It is reasonable to expect that if the heat was carried away by the water as fast as it passed through the iron of the cylinder wall, the difference in temperature of thermometers *A* and *B* (Fig. 1) would remain practically constant. This is borne out by simultaneous readings taken at intervals of 5°, and shown in the temperature curve. With the engine and apparatus used in the test it was found to require a little less than 30 minutes to bring the system up to 10 pounds steam pressure. In later tests the pressures have been increased to 50 pounds, equivalent to a temperature of 297°.

It naturally follows that, if an enclosed cooling system is used and only steam is allowed to escape, all of the water used must eventually be turned into steam, and the 32 per cent. of the total heat units of the fuel referred to as lost to the water jackets is fully recovered in the heat units transferred to the steam. Careful calculation from the results shows this to be the case.

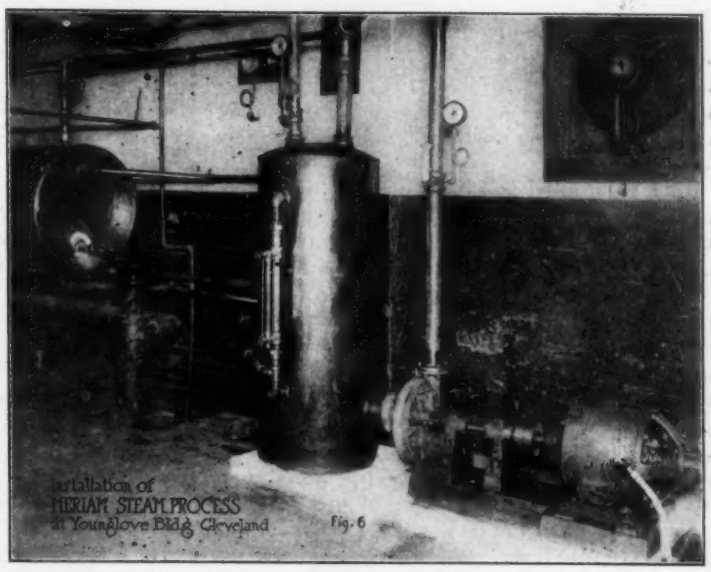
With a well designed exhaust gas boiler, one-half of the 38 per cent. of heat units of the fuel lost in the exhaust, can be recovered and added to the 32 per cent. recovered from the water jacket, which will give approximately 50 per cent. of the total B. T. U.'s of the fuel available in the form of low pressure steam. It is interesting to note that an exhaust boiler, any low pressure boiler located close to the engine, can be included as a part of the system. The engine tested was equipped with a water jacketed exhaust manifold, but had no exhaust gas boiler, and it was found that the temperature of the exhaust gases leaving the engine at full load beyond the water jacketed manifold exceeded 950° F.

Even with an engine of high efficiency, and operating at maximum load, there will be evaporaied by this process approximately 4 pounds of water into steam at 25 pounds pressure for each brake horse power delivered by the engine. As might be expected, the quantity of steam generated per brake horse power hour increases as the load decreases, due to the fact that the engine under these conditions has a lower thermal efficiency, and the fuel consumption per brake horse power hour is therefore greater. In these tests it was found that at one-fourth load the evaporation was 7.3 pounds of water per brake horse power hour.

No difficulties or detrimental effects are experienced operating the engine at maximum load and with the jackets under full steam pressure and temperature. On the contrary, the resulting condition is most favorable, since the water passes through the cylinder at such high velocity and in such large volume that the difference in tem perature between the entering and outgoing water is less than 15°, and the cylinder and other parts of the engine are maintained at uniform temperatures. It is interesting to note also that this temperature remains constant irrespective of the load, as it is determined wholly by the steam pressure carried on the system. It is believed by the writer that this fact will prove of great value in overcoming the difficulties on large engines from expansion and contraction due to changes in temperature.

Another marked advantage of this process is that the thermal efficiency of the engine is improved so that the fuel consumed is at least 2 per cent. less at maximum load, and fully 15 per cent. less at one-fourth load. Even where the steam generated has no value, the process pays well for its installation in the two items of improved efficiency and saving in water costs. The large quantity of steam produced is available for heating during the colder months, and for many kinds of industrial service where otherwise a special boiler or supply of steam would be required. Plants already installed are supplying steam to jacketed wax pots in shoe factories, steam coils in drying rooms, hotel hot water supply, nickel plating baths, etc. The process has been in service on one engine of 150-horse power for more than 8 months.

Fig. 6 shows the installation in the Younglove Building, Cleveland. where there are 3 gas engines, 150, 60 and 30-horse power. The motor-driven centrifugal pump supplies the high velocity water to any or all engines and but one expansion tank is used. The horizontal tank in the cut is the hot water supply for the building, fitted with a steam coil which receives its supply from the process, or from the low pressure heating boiler in the next room. This allows the hot water tank to be carried at full city pressure while the jackets of the engine are submitted to low pressures only, in this particular case, 5 to 10 pounds. A 1¼-inch pipe connects the bottom of the process tank with the bottom of the heating boiler in the next room, the water level in both being the same.



The process is applicable to every form of internal combustion engine, whether operating upon gas or oil.

Low Temperature Carbonization Gas Works.

[From a paper by G. E. Foxwell, in *London Journal*.]

For some time past low temperature carbonization has been greatly in evidence, and it cannot now be doubted that in some form or other it has come to stay. Thousands of pounds have been spent on experiments, and investigators have now brought their ideas into workable form, and plants are actually working or in course of erection in this country. It has been frequently stated that the future of low temperature carbonization lies with gas works, and the writer proposes to discuss this application of it.

It is clear that no gas engineer will give up the present system of carbonization, with its high yield of gas, for a system which will only produce 5,000 to 6,000 cubic feet per ton of coal. The only possible solution of the question is a combination of low temperature carbonization and water gas plant in which the residue left from distillation would be completely gasified, similar to the "double gas" of Professor Strache. But it gives the added advantage of a gas conforming to the present standards without the necessity for carburetting, except under unusual circumstances. The retorts would be heated by producer gas made in outside producers, using low-grade fuel, or a portion of the unpurified water gas might be used.

As at present worked, low temperature carbonization systems are designed to produce a free-burning, smokeless coke, and a high yield of oils Gas-works coke usually contains anything up to 2 per cent. of volatile matter, and only burns freely with a strong draught, and for this reason does not find great favor for household uses. If 5 or 6 per cent. of volatile matter is retained in the coke, it will burn freely and without smoke. This produces a cheerful fire and keeps the atmosphere clear. Low temperature carbonization retains from 5 to 10 per cent. of volatile in the coke; a high yield of oils is obtained, partly from the tar and partly from stripping the gas—analogous to the removal of benzol from coke-oven gas. In some systems the distillation is carried out under a vacuum of from 15 to 28 inches of mercury, in others under pressure, or gas is passed through the carbonizing mass to sweep away the products of distillation. The temperature varies with the different systems from 450° to 650° C. At the low temperature the tar produced is of paraffinoid character, and strongly resembles petroleum. As the temperature rises towards 600° C. benzene bodies appear, and an intermediate tar is produced. The quantity of sulphate of ammonia produced is much the same as the ordinary gas works yield, 20 and 28 pounds per ton of coal carbonized.

The retorts used are either inclined or vertical. In one system iron retorts are set at an angle of 15°; the coal conveyed from a hopper at the lower end and through the retort by screw conveyors. The retorts are heated by a portion of the gas evolved. The length of time the coal is in the retort is regulated by the speed of the screw conveyor.

One point to be borne in mind is that the layer of coal should be as thin as possible. In one design of retort this has been specially allowed for. The retort is vertical, and consists of two concentric annular rings, 3 inches in diameter, and a small central ring. Coal is placed in the two outer rings, a portion of the hot gases of distillation passes up the centre ring and heats the interior. The retorts are worked at a vacuum of 26 inches of mercury. On leaving the retorts the gases evolved go to the by-product plant. The heavy hydrocarbon vapors are removed by a "P. and A." tar extractor. At this point the calorific value of the gas is about 1,000 B. T. U.'s. After passing the exhauster, the gas is subjected to a pressure of from 50 to 60 pounds per square inch. This pressure is suddenly released, which causes a quantity of light oils to condense, and lowers the calorific value to 750 B. T. U.'s. The remaining light oils and ammonia are then removed by scrubbing, and the gas now reduced to 300 B. T. U.'s per cubic foot, is returned to heat the retorts. The gas obtained is about 5,000 to 7,000 cubic feet per ton of coal carbonized.

It will be noticed that after the extraction of the tar there is 5,000 and 7,000 cubic feet of gas, having a calorific value of 1,000 B.T.U.'s. In adapting such a system to gas works, it would seem advisable to stop at this point and use the gas for enriching purposes. The hot residue from the retorts might be transferred directly to a water-gas plant, or the generator could be fed with cooled coke in the usual way. The water gas obtained would have a calorific value of about 320 B.T.U.'s.

Low temperature coke is suitable for water gas plants. Owing to its low specific gravity the blast has to be reduced; but its inflammability more than counteracts this. The rich gas from the low temperature retorts would then be mixed with the blue water gas. All the figures given, and estimates made in this article are based on heating values only, though probably the same considerations would apply in the case of illuminating power.

The general effect of such a scheme may be seen by considering the thermal units in the gas from a ton of coal.

	Total B.T.U.'s Obtained.
Gas evolved by low temperature distillation = 5,000 cubic feet, calorific value of 1,000 B. T. U.'s.....	5,000,000
Gas from the low temperature coke in a watar gas plant (= 70,000 cubic feet per ton of fuel) assuming that 14 cwt. of coke per ton of coal carbonized is gasified = 49,000 cubic feet, of 320 B. T. U.'s....	15,680,000
Total, 54,000 cubic feet of gas.....	20,680,000

That is to say, the average gas would have a value of about 383 B. T. U.'s.

Few places have a standard as low as 383 B. T. U.'s. It must be remembered, however, that gas companies do not exist solely for the production of gas; they have another duty, that of producing coke. It would be necessary, therefore, to install a further low temperature plant for producing a solid smokeless fuel, and the market for it would have to be cultivated until the properties of the new fuel were known. But the point is that no excess of coke need be produced—in other words, the coke output may be varied with the demand. If, at any time the demand for smokeless fuel should become so low that the amount of coal carbonized to meet the reduced demand is not enough to produce sufficient enriching gas, carburetting could be resorted to. In view, however, of the excellence of the coke produced, and the relatively small amount necessary to make to keep the gas up to standard, this should never be required.

The gas evolved from these second retorts would serve to enrich the poorer gas obtained above. Assuming a yield of 60 per cent. of coke and 12,000 cubic feet of gas per ton of coal in ordinary gas works practice, it follows that for every 1,000 cubic feet of gas made, 1 cwt. of coke is produced. This quantity of coke is rather more than the gas manager is able to sell comfortably. Supposing ¾ cwt. of coke is made by the low temperature process for each 1,000 cubic feet of gas produced, we get the following figures

This is equivalent to gas of 544.5 B. T. U.'s per cubic foot; a gas of quite a good quality; and by increasing or decreasing the rich gas mixed with the water gas the heating value of the gas can be varied at will.

	Equivalenf to B. T. U.
Total gas produced from 1 ton of coal (as above) = 54,000 cubic feet.....	20,680,000
One ton of coal produces about 14 cwt. smokeless fuel, allowing 0.75 cwt. of coke to each 1,000 cubic feet of total gas output, 3.83 tons of coal would be required. Gas produced from low temperature distillation of 3.83 tons of coal = (approximately) 19,150 cubic feet of gas of 1,000 B. T. U.'s.....	19,150,000
Total, 73,150 cubic feet of gas.....	39,830,000

No reliable information is available as to the actual yields of oil, etc., obtained under working conditions. Most of the figures issued to the public having been obtained under test conditions.

In order to arrive at a reasonable estimate of the finances involved a set of figures issued by a prominent low temperature firm have been taken and 25 per cent. deducted from all yields save coke and ammonia.

The total yield of oil from bituminous coal is between 16 and 22 gallons per ton. Taking the lower figure the yields on fractionation would be about as follows;

Light oils.....	1 gallon.
Middle oils.....	4.3 gallons.
Lubricating oils.....	3 gallons.
Pitch	70 pounds.

The other products obtained from the distillation of a ton of coal are:

Coke.....	14 cwt. (70 per cent.)
Sulphate of ammonia.....	24 pounds.

In a works making 3 million cubic feet of gas a day, and with a yield of 12,000 cubic feet per ton of coal carbonized, the amount of coal used per day is 250 tons. For every ton of coal used we have assumed that 3.83 tons would be used for coke making and the production of enriching gas, and so, since 4.83 tons produce 73,150 cubic feet of gas (as calculated above), the total coal used to produce 3,000,000 cubic feet would be, roughly, 200 tons.

The account for each day's working, excludings purification and distribution costs, would be:

Receipts.

Gas—3,000,000 cubic feet, at 37½c.....	$1,125.00
Coke—110 tons, at $3.75.....	412.50
Sulphate of ammonia—2.14 tons—net value.....	49.50
Light oils—200 gallons, at 25c.....	50.00
Middle oils—860 gallons, at 14c.....	120.40
Lubricating oils—600 galions, at 12c.....	72.00
Pitch—6.25 tons, at $8.75.....	54.69
	$1,884.09

Expenses.

Coal—200 tons, at $3.25.....	650.00
Cost of heating and working retorts, at 62.5c per ton.....	125.00
Cost of distilling oils, at 62.5c per ton of coal carbonized....	125.00
	$900.00

Or about $1,000 per day would be available for the water-gas plant, purification, distribution costs, and profit. It will also be noticed that the smokeloss fuel produced is put at $3.75 per ton; whereas in the balance sheets of most low temperature companies it is put at $7.50. There seems, therefore, no reason to doubt the above balance-sheet, since any error in the figures is on the side unfavorable to the system. It must be noted, however, that if low-temperature systems were extensively adopted the prices obtainable for the by-products would probably drop. The figures given for the cost of working the retorts and distilling the oils are supplied by one of the best known low temperature firms. The gas is put at quite a low figure.

Apart from the advantages above, the system would give freedom from napthalene troubles owing to the fact that the coal is distilled at a low temperature.

There are, however, several points on which some further light is required before such a system can be seriously considered. In the first place little or no information is available as to the first cost of a plant. According to Professor Lewes and other authorities, low-temperature carbonization is the most scientific method yet indicated of dealing with our coal supplies. It is unfortunate, however, in having come under the notice of the company promoter in some instances. As a consequence, schemes involving its use are looked on with suspicion by technical men and the general public.

There is no reliable information on the cost of up-keep of a plant and the number of men required to work it. Water-gas gives a great saving in labor over the usual retort house practice; but whether a combination of low temperature retorts and water-gas plant would do so seems open to question. In most low temperature processes the time required for carbonization is somewhat prolonged considering the weight of the charge. But here, again, information is very meagre; and until it is forthcoming on the points enumerated, the gas engineer will not be anxious to alter his present system of carbonization.

Compensation of Meter Readers.

[Written for Ninth Meeting, American Gas Institute, by MR. H. P. SCHAPER.]

About a year ago the Milwaukee Gas Light Company decided to change its method of compensating meter readers from paying a certain rate per hour, irrespective of the number of readings taken, to paying a rate per hour for a specified minimum number of readings per hour, and for readings above the minimum return to pay a bonus. The reason for making this change was primarily to establish a system that would more equitably compensate meter readers for actual work done. Some idea of what constituted a reasonable hour's work had been established by years of experience, although districts vary greatly, some localities offering opportunities for reading meters easily, while others are harder to get and fewer are read. Furthermore, conditions are likely to change in a district, so that an average per hour basis does not in every case show whether or not a reader has done an honest hour's work.

In 1907 our company abolished separate rates for fuel and illuminating gas, and began to remove duplicate meters. This, of course, reduced the average returns per hour, and when this work was completed it was necessary to establish some new basis for hourly return. To determine this we picked five men from our reading force and put them on a monthly basis. They were paid $60 per month, irrespective of the number of hours worked each day; but we made provision that no more than eight hours were to be put in on any one day. We had been getting an average of 25 readings per hour, but by making this change we increased it to 30 per hour; not only from the monthly men, but from the day men as well. After several months' trial, we concluded that 30 readings per hour represented a reasonable return, and this was used as a basis for our present method.

New men are paid 24 cents per hour, and with continued service this rate is gradually increased to 27 cents. For this a minimum return of 30 readings per hour is expected, so that our primary labor cost is from 0.008 to 0.009 per reading. For readings in excess of the 30 per hour the men receive extra compensation at the rate of 0.008 per reading. This has made it possible to do our work with 22 men, in charge of one supervisor, at an average cost per reading of 0.0105, including the salary of supervisor and miscellaneous expenses. Under the old system it required 26 readers with a supervisor at an average cost of 0.0125 per reading. We have not so far found it necessary to fine a man for not bringing in the minimum number of readings, and whether we would do this or not I question very much, as one who could not bring in the minimum number of readings per hour would hardly be considered competent and would be discharged.

At the end of each of the three reading periods, each man reads his own "stragglers and retakes," for which he is paid a flat rate of $1.25, irrespective of how many or how few he has. Our purpose is to encourage bringing in as few "stragglers" as possible, and the fewer a reader has the easier he earns the $1.25. We find that men will make a second call to get the reading at the regular time, rather than report "not at home," as it lessens his work on "straggler day," besides paying him the bonus on regular reading days. As evidence, I submit the number of "stragglers" we had for March, 1913 and March, 1914—4,536 and 2,698, respectively. Another material reason is to avoid the making of "stragglers" purposely. If we paid them some equitable rate per reading, which of necessity would be higher than the regular reading rate, the meter reader could purposely fail to read some meters at the regular reading time, and receive the higher rate of pay. With a flat rate of $1.25 this is overcome.

We have approximately 200 meters that are read weekly, and, as these are scattered, we play a flat rate of 30 cents per hour. This rate is also paid when special readings are taken.

Our meter readers deliver gas bills, and this work is likewise paid for on the merit basis. The rate is the same as for meter reading—from 24 cents to 27 cents per hour for a minimum delivery of 65 bills per hour. For each bill delivered over this average they receive extra pay at the rate of 0.004 per delivery. This has resulted in reducing the cost per delivery from 0.0062 to 0.0053. Occasionally we have special work for them which can be done in connection with their regular work, such as delivering advertising matter or making canvasses. Frequently we put advertising stickers on our gas bills, and for attaching these we pay them 5 cents per hundred, and for delivery an additional 5 cents per hundred. Some months ago we made a canvass of large dwellings having certain types of heating apparatus, and for each prospect accepted by us the reader was paid 5 cents.

The average wages paid during the past eleven months is $61.48, compared with a previous average of $55.21. The maximum average earned by one reader was $71.45, and the maximum month for any reader was $75.89. Another result that will commend itself is that our men always appear busy, as loitering pays them nothing. To have a busy man read his meter inspires a consumer with more confidence than to see a boy, or sometimes a pair of them, fooling away their time.

Our readers are apparently very well satisfied with this merit system. The best evidence of this is the fact that we have had no men leave us since it was inaugurated. Our men are taken from all walks of life—mechanics, former school teachers, artists, musicians, ball players, etc. When necessary to call in an extra man to help out we usually get students of the high schools or the university. Our men are uniformed, the uniform being of approved design, made for us by one tailoring concern. They are charged to the men and paid for in installments of $3 per month. No objections have been raised to wearing uniforms, and they present a neater appearance and are readily recognized by consumers as gas meter readers.

We aim to keep our readers in the same district as long as possible, as greater confidence in the reader is felt as he becomes familiar to the consumer. We are opposed to any system of trying to check up the readers that will require frequent changes of reading districts, an annoyance to the consumer. We endeavor to get reliable men and then trust them, and our trust in them has so far not been misused. We use a coupon reading slip, and cut off the previous reading before the slips are turned over to the readers. We get a check on the readers by our meter changes, and while this may not be oftener than once a year, the reader is in the dark as to just when such a change will be made, and he will not risk his position knowing that any time he may be found out.

Have your force of readers composed of reliable men; have them neat appearing and easily recognizable by uniforming them, and always appearing busy and on the job, and you have opened the way to greater confidence of the consumer. It is a rare occurrence for us to receive a complaint against a meter reader, and it has been 8 or 10 years since we have had a complaint serious enough to cause dismissal.

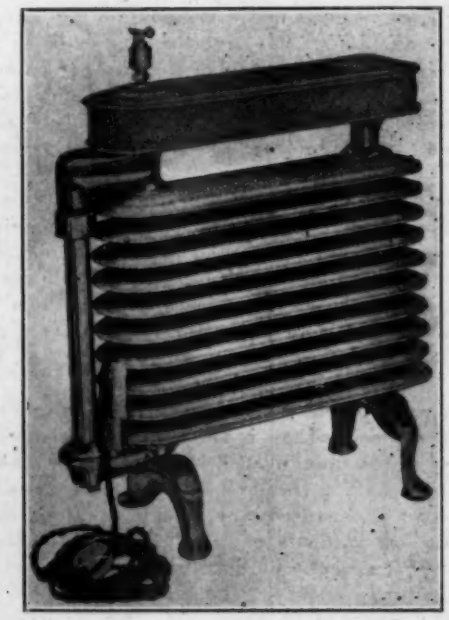
Indiana Commission Grants Increased Rates.

Practically for the first time since its creation, the Indiana Public Service Commission has allowed a general increase in rates for a public service corporation. The commission decided a case in which the Greencastle Water Works Company, a private corporation, had asked to be allowed to increase its rates on the ground that the existing rates were inadequate to pay proper returns on the value of the property. The action of the commission will enable the annual income of the company to be raised from $18,128.36 to $22,500. The company will be allowed to charge private consumers 40 cents for 1,000 gallons of water, instead of 30 cents, the existing rate, and allowed rates for fire hydrants to be increased from $43 a year to $50 a year. The commission put all services on a meter basis. It ordered the elimination of all free services; and established minimum monthly charges running from 50 cents for one-half inch connection. to $6 for a 6-inch connection. The commission established a valuation on the company's property of $150,000, and said the income under the increased rates would be sufficient for the operating expenses and to pay 6 per cent. on the appraised value of the company's property.

A DELAWARE charter has been granted to the Fuelite Corporation of New York, with capital of $4,250,000, to manufacture and deal in gas products.

New Methods and Appliances.

ELECTRIC HOT-WATER RADIATOR.—This hot-water radiator has a heating element in the bottom section and can be connected to any lighting socket. The total heating surface is 18 square feet. It



weighs 65 pounds filled with water, and, as the feet are polished, can be easily pushed from one place to another. The over-all dimensions are; length, 20.5 inches; width, 6 inches; height, 22 inches.

EFFECT OF SUPERHEATED STEAM ON CAST IRON FITTINGS.—Gray cast iron fittings show a tendency to crack and increase in size when employed on superheated or high-pressure steam systems. The cracks, although hairlike at first, frequently widen, allowing enough steam to escape to make their presence noticeable. Fittings containing cracks may be weakened to such an extent that they will burst under working pressure. The permanent stretch in cast iron fittings may also become a source of annoyance as it had been observed to be as much as 2.5 per cent. of the linear dimensions.

A high grade of cast iron may be employed satisfactorily for fittings having an internal diameter of less than 4 inches, but for larger sizes mild cast steel is the best material. To prevent cracks, which usually develop in the flanges in or near the fillets, the fittings should be provided with long tapering fillets. Semi-steel, or "gun iron," will also give satisfaction if its composition approaches mild steel. What has been said of pipe fittings also applies to valve bodies and all other fittings exposed to the action of superheated steam.

MELTING POINTS OF COPPER ALLOYS.—The table below shows the melting points of certain commercial casting alloys containing copper, zinc, tin and lead, or copper with two of the other components. The melting points are probably correct within 5° C.

Alloys.	Composition				Melting Point	
	Copper.	Zinc.	Tin.	Lead.	C.	Fah.
Gun metal	88.0	2.0	10.0	....	995	1,825
Leaded gun metal	85.4	1.9	9.7	3.0	980	1,795
Red brass	85.0	5.0	5.0	....	970	1,780
Low grade red brass	81.5	10.4	3.1	5.0	980	1,795
Leaded bronze	80.0	....	....	10.0	945	1,735
Bronze with zinc	84.6	5.0	10.4	....	980	1,795
Half yellow, half red	75.0	20.0	2.0	2.0	920	1,690
Cast yellow brass	66.9	30.8	....	2.3	895	1,645
Naval brass	61.7	36.9	1.4	....	885	1,570

The temperatures were determined by a calibrated platinum thermocouple, checked against one calibrated by the Bureau of Standards. Melting points were determined by plotting temperatures against time, as the alloy cooled from a liquid to a frozen state, and also as it was heated, after freezing, to a molten state. Temperature readings were taken every 15 seconds, the alloy being stirred before each reading.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Gas Study Club, of Wilmington, Del., elected the following officers at its last meeting: Harry Croak, President; Edward Greenhalgh, Vice President; George H. Lackey, Treasurer, and W. T. Banning, Secretary. Charles McConnell was elected Trustee, and William McCracken, W. J. McCorkindale, J. H. Stickel and W. A. Morris, Councilmen.

IT is reported that a contract has been made by which the Texas Power and Light Company agrees to distribute natural gas through its mains in Waco. Gas will be furnished by the Mexia Gas Company, and, unless present plans are interfered with, natural gas will be distributed in Waco within the next four months. The first shipment of pipe for the Mexia-Waco pipe line has been received at Mexia.

"P. E.," WRITING from San Antonio, Tex., says that a gas generating set which has a capacity equal to the two now in use at the local plant is being installed. Its daily capacity is 2,400,000 feet of gas, and that of the two machines now in use is 2,500,000 for the same period. The new machine cost $28,000, and will answer the needs of the city for some time to come, according to the average increase in business. The San Antonio Gas and Electric Company is putting down a 7,000-foot feeder main to give service to residents of East Laurel Heights and increase the volume of gas to patrons in the western part of the Laurel Heights addition. The main runs from Dallas street and Brooklyn avenue to Woodlawn avenue.

THE Dansville (N. Y.) Gas and Electric Company, which for the past 8 years has been owned by Philadelphia capitalists, headed by William Maul Measey, has been sold to L. T. Mason, of Hornell, and associates. The stockholders of the new company held a meeting in Dansville and elected the following directors for the ensuing year: L. T. Mason, C. E. Mason, J. E. Mason, B. P. Proctor and C. G. MacEvoy. Officers were chosen as follows: L. T. Mason, President; C. E. Mason, Vice-President and Treasurer; C. G. MacEvoy, Secretary and Superintendent.

THE Salem (Mass.) Gas Light Company has sent a communication to the City Council to the effect that on account of its recent fire losses it could not give a lower price for gas at the present time, but would do so as soon as conditions warranted. The price of gas in Salem now is less than the Lynn company charged when a similar amount of gas was there being used. The communication was signed by President Henry A. Hale.

THE world's greatest gas well, located on the Maxmoore lease on the bed of the Cimarron River, near Yale (Okla.), which has been on fire some weeks is still burning, with the blaze increasing in intensity. Millions of dollars worth of property are endangered and every effort to conquer the blaze has been futile.

M. D. MIDDLETON has been appointed receiver for the Standard Gas Company of Sea Isle City, N. J. Creditors of the concern asked that a receiver be appointed to wind up the affairs of the company, which they claim got into financial difficulty because of the low rate charged patrons of the company. The Standard has been charging a $1.25 rate, while surrounding companies have been requiring patrons to pay $1.40 and $1.60 for the same service. The receiver will try to make a quick sale of the plant that is valued at $38,000. The debts of the concern are said to be in the neighborhood of $10,000.

THE Wagner-Dunn gas franchise has been granted by the City Council of Johnson City, Tenn. The company expects to begin work at an early date. About $100,000 is to be expended in the building of this plant. The work is to be completed by midsummer of next year.

THE Bridgeport (Conn.) Gas Light Company has announced a reduction in rates as of January 1st, 1915. The gross price to all consumers is $1.10 per thousand, with 10 cents discount. In addition to this discount further discounts will be allowed for quantities used through a single meter in excess of ten thousand cubic feet per month as follows:

First	10,000 cubic feet,	None
Next	5,000 cubic feet,	5 cents per 1,000
Next	5,000 cubic feet,	10 cents per 1,000
Next	10,000 cubic feet,	15 cents per 1,000
Next	20,000 cubic feet,	20 cents per 1,000
Next	50,000 cubic feet,	25 cents per 1,000
Next	100,000 cubic feet,	30 cents per 2,000
Next	300,000 cubic feet,	35 cents per 1,000
All over	500,000 cubic feet,	40 cents per 1,000

Where more than one meter is used these discounts, less 25 cents per month for each additional meter, may be applied to total consumption of one consumer in the same premises.

ARBITRATION has settled the controversy over the moving of the gas main under Baltic avenue, Atlantic City, N. J., which threatened to hold up the paving of that thoroughfare. The city has accepted the proposition of the Atlantic City Gas Company, whereby no contract will be given out for the removal, but the corporation's engineers will have charge of the work and hire what help may be necessary.

THE Portland (Me) Gas Light Company has served notice on its customers that under the new public utilities law it cannot legally give discounts to customers after the time expires when the bills state discounts will be given. The notice says: "In the future, because of this law, we shall be obliged to rigidly enforce the rule as regards discounts on our bills, and unless they are paid on or before the discount date mentioned, or within the time stated on the bills, no discount can be allowed."

TRENTON, N. J., has appealed to the Public Utility Commission asking that the illuminating gas supplied to the municipality by the Public Service Gas Company be investigated on the ground that numerous complaints have been filed to the effect that it is of inferior quality.

THE Brooklyn Union Gas Company's gas sales during 9 months ended Sept. 30, 1914, were 10,303,857,000 cubic feet, an increase of 579,000,000, or 5.9 per cent. over last year. The increase for 1913 over 1912 was less than 3 per cent. In 1913 they sold 45,000 gas appliances for $369,000, compared with $293,000 in 1912, an increase of 26 per cent. Proportion of increase has been maintained thus far this year, appliance sales for 9 months ending Sept. 30 amounting to $304,000. This year they have laid 67 miles of mains, giving 1,450 miles compared with 740, nineteen years ago. Gain in services, 1914, is 6,869, giving a total of 182,752. Meters number 469,049, an increase of 19,338. Street lamps number 19,870. Sales per meter in 1913 decreased 3.94 per cent., but is gaining this year, an increase of 8 2 per cent. being shown thus far. Manufacturing capacity is 58,000,000 cubic feet a day, and holder capacity 46,000,000. Maximum day's sendout thus far has been 47,200,000, but 50,000,000 mark will be crossed before end of the year.

PRESIDENT GEORGE P. SMITH, of tbe Missoula (Mont.) Gas Company, announces a change in the management of that concern. The demands on the company have become so insistent that it has been decided to increase the efficiency of the plant and its service. To do this the company has secured the services of William A. Baehr, of Chicago, as general manager.

THE controlling interest in the Bucks County Public Service Company and the Doylestown (Pa.) Gas Company has been sold by Kuemmerle & Company, of Philadelphia, to John P. Braun and associates, also of Philadelphia. The following officers and directors have been elected by the new owners: President, John O. Sheetz; Secretary and Treasurer, J. G. Lowry. Directors—John O. Sheetz, Herman Stein, W. Harold Braun, E. C. Worrell, Clarence E. Kuemmerle, Charles E. Pugh and Isaac T. Haines.

BY a contract entered into with the city of St. Paul, Minn., Nov. 12th, the St. Paul Gas Light Company will receive $10.50 a lamp for furnishing gas to 4,920 gas lamps within the city. This is on the basis of 75 cents per 1,000 cubic feet. The contract means the payment by the city of $51,660 for street lighting by gas. At the same meeting bids for electric lighting were rejected as unsatisfactory, $60 a year being the lowest bid for furnishing current to old carbon arcs.

FROM the New York *Evening Telegram*: "Mr. George W. Perkins, who told us to dodge the high cost of living by foregoing meat and eating fish, has been joined by Colonel 'Bob' Livingston, who says, in *Gas Logic*, we are too wasteful with our potatoes. He has been experimenting, and reports: 'One lot of potatoes, which had been pared, showed a loss in weight of 38 per cent. The second lot had been scraped, and showed a loss of only 7 per cent.' By combined experiments the two citizens might be able to devise a toothsome and highly nutritious fishball from the potato scrapings and the fish heads, tails and fins."

"R. I. C.," SENDS this from Woonsocket, R. I.: The Blackstone Valley Gas and Electric Company's big gener ator, more familiarly known as the Woonsocket Gas and Electric Emp loyees' Club, used for generating good times, was started up recently, after being shut down for the summer. As the engineer would say, load factor and power factor were 100 per cent. James H. Jewell an d his associates on the house committee lived up to their reputations, and the splendid supper served did much to instil in and make every one present a conductor of the "good time" spirit. J. B. Thrasher, of Boston, the speaker for the evening, was a veritable power house of enjoyment, telling in the dialect of the French Canadian, stories of the northern frontier life of these people. A short business session was held, at which it was stated that the cup presented by Mr. Townsend, was to be used as a trophy for a whist tournament, and a committee was appointed to arrange for it. Committees were also appointed to consider pool and bowling tournaments.

MR. WALTER G. AFRICA, general manager of the Peoples Gas Light Company, of Manchester, N. H., is away on his annual hunting trip. Mr. J. C. Aaron is absent on a similar errand, but whether for or with Mr. Africa is not stated.

THE Detroit City (Mich.) Gas Co mpany is about to start construction work on a plant in River Rouge to cost in the neighborhood of $1,500,000. It will cover approximately 80 acres. Mr. V. L. Dewey, Vice-President and General Manager of the company, is quoted as saying that the proposed plant will merely be a unit of a gigantic establishment which, when comple ted, will cost betweon $7,000,000 and $8,000,000. Mr. Dewey says the company is planning the largest gas plant in the world and was figuring on the day when Detroit would be a city of 1,000,000 people.

THE total number af customers supplied with gas, steam and electricity by the Pacific Gas and Electric Compan y, has more than doubled in the last 7 years, according to a statement recently made by Vice-President Hockenbeamer. Comparing the number of customors served by each of the three departments in 1907 with the present service, he states that the gas consumers have increased by 99,727, electric energy consumers by 91,989, and steam and water consumers by 3,854. Tne company is now serving in all departments a total of 368,498 patrons.

MAYOR WALLACE G. NYE, of Minneapolis, who will deliver the address of welcome to the National Commercial Gas Association, was in New York city all of last week. On Tuesday he was entertained by Mr. Alexander Sinai, Manager, Lindsay Light Company, who is an old time friend and former resident of Minneapolis.

THE time allowed the Southern Gas Improvement Co mpany, of Philadelphia, in which to build a gas plant at Kinston, N. C., has expired, and it is doubtful if the city will grant another franchise. No word has been had from the company in several weeks, but in late summer they stated that the depression growing out of the war conditions was causing a delay in their construction operations. The plant intended for Kinston would have cost around $100,000, including 12 miles of mains.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,116,653. Apparatus for Manufacturing Carbureted Gas. W. J. Watkins, Fort Worth, Tex., assignor to O. G. Hurdleston, same place.

1,116,665. Gas Burning Stove. J. C. Ziegler, Wichita Falls, Tex.

1,116,912. Gas Burner. R. T. Parisen, Knoxville, Pa., assignor to Lawson Mfg. Co., Homestead, Pa.

Utilities Commission News.

BUFFALO (N.Y.) NATURAL GAS CASES.—Commissioner D. P. Hodson has heard the complaint of the city of North Tonawanda against the Niagara Light, Heat and Power Company and the application of the latter to sell natural gas to the Buffalo Gas Company at the city line. The Niagara Company has substituted artificial for natural gas in its Tonawanda mains, and wants to sell the supply from its wells to Williamsville, Amherst, and the northern part of Buffalo, the latter coming in under an old franchise secured by the Bennett interests when Central Park was laid out. Mains have been laid through some of the streets in Central Park by the Buffalo Company. The Niagara Company entered the plea that its supply of natural gas was insufficient to supply the 569 customers in North Tonawanda, owing to a falling-off in the production of its wells. It had enough for the 139 customers along the Williamsville road, it was said. Where the supply for Central Park and Northern Buffalo was to come from did not develop at the hearing.

THE application of the Municipal Gas and Electric Department of Cambridge, Mass., to the Gas and Electric Commission for permission to sell gas at 90 cents per 1,000 cubic feet, or 10 cents less than the present price, will undoubtedly be passed upon favorably. At the hearing last week no adverse comments were heard, and the commissioners expressed themselves as satisfied with the reports furnished by Manager Kirkpatrick. It is pointed out that with the decreased price a much greater volume of business can be secured. The present average daily consumption is about 600,000 cubic feet. Should the reduction be granted it is estimated that 1,000,000 cubic feet would soon be the minimum. The gas plant cost approximately, $200,000.

COMPLAINT DISMISSED.—The complaint brought by the city of Coalinga, Cal., against the Coalinga Gas and Power Company has been dismissed. The city alleged that the gas company's rates were excessive and unreasonable, and asked for a reduction from $2 to $1 per 1,000 cubic feet. The company contended that its revenues were constantly decreasing because of a falling off in the population of the city of Coalinga and a lessened consumption due to the introduction of natural gas. The commission found that the company's earnings are at the present time only slightly in excess of 7 per cent. and the rate was held to be not unreasonable under existing conditions.

WESTCHESTER, N. Y., HEARINGS.—The application of Westchester county villages for cheaper lighting rates will soon be decided by the up-State Public Service Commission.

At the hearing Mr. Mathewson, for the company, insisted that the $1.50 rate for the gas in the complaining villages was not excessive in that the record proved that the return of the company on its investment was only a little more than 4 per cent.

He said that where the units to be served are as scattered as the Westchester villages, the larger investment required and the greater expense of distribution made unfair any comparison with the rates for gas in more densely settled communities.

He called attention to the fact that the larger and more closely settled communities in the county, such as Yonkers, New Rochelle and Mount Vernon, were not among those complaining against the rates of the Westchester Lighting Company.

COLORADO UTILITIES REPORTS.—Corporations have begun to file statements of their rates and charges with the State Public Utilities Commission, as required by law. Among the companies which so far have submitted rate schedules are the Mountain States Telephone and Telegraph Company, the Postal Telegraph Company, the Pueblo Gas and Electric Light Company, the Brush Light and Power Company, and the Pullman Company. Municipalities conducting their own utilities must also file statements, and the city of Longmont was the first to do so.

PORTLAND COMPANY OBJECTS TO DEMANDS OF OREGON COMMISSION.—Will the Portland Gas and Coke Company raise the standard of heat units in the gas furnished consumers at an increased cost of $100,000 a year to comply with the new ruling of the State Railroad Commission, or will it be able to show that this ruling should not be enforced in Oregon? At the present, Portland is receiving gas rated at 560 B. T. U.'s. In the standard of service of public utilities, the Railroad Commission demands that the gas should be rated at 600 B. T. U.'s. This is the rating in Washington, Wisconsin, New Jersey and several other States.

Financial Notes.

THE Coast Counties Gas and Electric Co., has applied to the California railroad commission for authority to issue $50,000 six per cent. debentures at not less than 90, the proceeds to be used to reimburse the treasury of the company for capital expenditures made from incomes.

DIRECTORS of the Ohio Cities Gas Company have declared the regular quarterly dividend of 1¼ per cent. on the outstanding common shares, payable Dec. 1 to holders of record Nov. 14. It was expected that the dividend rate would be advanced to a 6 per cent. basis on this distribution. However, it is understood that the management has considered the financial situation arising from war influences as making an ultra-conservative policy more advisable and quite in harmony with the judgment of most common shareholders. The company has a very large surplus in cash and is in as strong a financial position, it is held, as any public utility in Ohio. Earnings are said to be bearing out the estimates made at the time of the organization of the new company.

THE directors of The Troy Gas Company have voted to issue, December 1, $1,250,000 of stock to be used for the general purposes of the company, to be sold to the stockholders at par. There was nothing mentioned in the resolution as to what the money was to be used for, and from inside sources it was merely stated that it was for "general purposes." Some time ago the stockholders voted to authorize the corporation to increase its capital to the extent of $3,000,000, and this action was indorsed by the Public Service Commission. Thereafter the directors voted to issue one million on the authorization, and this last increase leaves but three quarters of a million to be issued at a later date.

PEOPLE'S Gas, Chicago, shares sold at 112½ last week and was 112½ bid later, with offerings at 113. This compares with 106 on July 30, and two dividends have been paid since that time.

THE increase in stock of the New England Coal and Coke Company from $500,000 to $1,500,000 is to fund $1,000,000 of floating debt. The 10,000 additional shares will be placed in the treasury of the Massachusetts Gas Companies, and $1,000,000 of New England Coal and Coke Company notes now in the treasury of the holding company will be cancelled.

YPSILANTI'S (Mich.) issue of municipal gas bonds amounting to $130,000, secured by a mortgage on the gas plant and a franchise, has been sold over the counter. The issue carries interest at the rate of 6 per cent. per annum.

REPORTS from five of the thirteen subsidiary companies of American Gas and Electric Company indicate that the operating properties of that corporation are continuing to make large gains in gross, with a good proportion of the increase being saved for net and surplus. The companies reporting are those at Atlantic City, N. J.; Scranton, Pa.; Wheeling. W. Va.; Canton, O., and Rockford, Ill. Wheeling is the only property to show a decrease in net and surplus from 1913, but even here, where there is a general business depression, the gain in gross was good. Consolidated earnings of the five companies for September, 1914, show gross of $237,565, an increase of $33,065, or 16 per cent. Net earnings were $128,837, a gain of $15,621, or 13.8 per cent., and surplus after charges, $87,102, an increase of $19,036, or 28 per cent. For the year ended September 30, 1914, consolidated gross earnings of the five properties were $2,896,626, an increase of $433,277, or 17.5 per cent. Net earnings of the company for the year were $1,548,657, a gain of $222,624, or 16.7 per cent., and the surplus after charges was $974,717, an increase of $151,750, or 18.4 per cent. over 1913.

MR. H. M. BYLLESBY, who has returned to Chicago after an inspection trip to the utility properties managed by H. M. Byllesby & Co. on the Pacific Coast, says: "I believe the Pacific Coast, in common with the whole country, is on the eve of a good commercial and industrial revival. It is evident that there is to be a heavy tourist movement to California this winter and to the whole coast later in the year, which will assure the success of the expositions at San Diego and San Francisco. Visitors will find underlying conditions good and the future promising. Upon arriving home after a 3 weeks absence I find a decided improvement in the demand for investment securities. Purchasing orders received for bonds, coupon notes and preferred stocks are gratifyingly large in volume compared with the market for three and one-half months past. This indicates not only that considerable amounts of capital in the United States are awaiting investment, but also returning confidence in our immediate commercial future. The earnings of our utility properties have been well maintained during the recent depression, and, taken as a whole, they have continued to show fair gains."